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SOUTHERN RHODESIA.

REPORT

OF THE

Secretary, Department of Agriculture

For the Year 1930.

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Presented to the Legislative Assembly,
1931.

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SOUTHERN RHODESIA.

Report of the Secretary, Department of Agriculture, for the Year 1930.

Presented to the Legislative Assembly,
1931.

I have the honour to submit herewith reports for the Department of Agriculture and Lands for the calendar year 1930.

Owing to the reorganisation of the Department in the year under review, these reports are modified in accordance with the new organisation.

Under this reorganisation, the whole Department of Agriculture and Lands, including the Lands Department, the Surveyor General's Department, the Agricultural Department, the Veterinary Department, the Department of Veterinary Research, has been concentrated under the administration of the Secretary to the Department of Agriculture and Lands, and regrouped as follows:—

The Division of Animal Industry, including:—

Veterinary Department,
Department of Animal Husbandry,
Dairy Branch,
Poultry Branch,

all under the control of the Chief of the Division of Animal Industry, Mr. J. M. Sinclair, M.R.C.V.S., who is also Chief Veterinary Surgeon.

The Division of Plant Industry, including:—

Agriculturist's Branch,
Tobacco Branch,
Horticulturist,
Botanist,
Plant Pathologist,
Experimental Farms and Stations,
Maize Graders, etc.,

under the control of the Chief of the Division of Plant Industry, Mr. H. G. Mundy, Dip.Agric., F.L.S., who is also Chief Agriculturist.

The Lands Department under the direct control of the Secretary of the Division, who assumes in his own person the functions of the Director and Assistant Director, Department of Lands.

The Surveyor General's Department, under the Surveyor General.

The Division of Agricultural Engineering, including Irrigation and Meteorology, under the Chief of the Division of Agricultural Engineering, who is also the Irrigation Engineer.

The Division of Forestry, under the Chief of the Division of Forestry, who is also the Chief Forest Officer.

The Entomological Branch, under the Chief Entomologist.

The Chemistry Branch, under the Chief Chemist.

The Department of Veterinary Research, under the Director of Veterinary Research.

It is hoped that this regrouping will facilitate that co-operation between the various activities of the Department as a whole which is essential if the full value of the contribution which each professional and technical officer can make to the work of the Department as a whole is to be obtained.

Adequate co-operation of research cannot, however, be obtained fully without professional guidance both as to the nature of the research and as to the allocation of detailed branches of the research to the suitable officers of the Department, and further without the careful co-ordination of the results obtained in each research, so that a definite conclusion may be obtained. For this purpose the post of Director of Agriculture has been re-established, and is held by Dr. C. K. Brain, M.A., D.Sc.

The reorganisation should thus result in greater efficiency and in economy.

The general conditions of the Agricultural Industry in 1930 are described in the reports attached hereto, and need not be referred to more particularly in this report, but one phase of the work of the Department not fully indicated in the departmental reports, namely, the loans made to farmers to assist them in their agricultural operations, is of general interest.

These loans come under four general heads:—

(1) Farm Development Loans.
(2) Live Stock Loans.
(3) Loans to Empire Settlers.
(4) Irrigation Loans.

Farm Development Loans, usually not exceeding £100 each, are made to established farmers to enable them to pay wages, purchase seeds, fertilisers, oxen, implements, etc., and to continue their operations pending the realisation of their crop. These loans are usually secured by stop orders on the crop and by hire purchase agreements, etc., and bear interest at the rate of 6 per cent. per annum.

The amount outstanding on the 31st December, 1930, was £25,200, divided over 276 loans.

The necessity of these loans is frequently due to the inadequate capital owned by the farmer, but in many cases it is due to accidental or temporary causes, such as the loss of a crop, etc.

On the whole the loans serve a useful purpose, and there is no doubt that many farmers have, with the assistance of these loans, been enabled to continue their operations, but it is disappointing, in some cases, to note the annual recurrence of the same debtors.

The amount hitherto written off against these loans amounts to £2,955.

The Live Stock Loan is intended to assist farmers to improve the quality of their stock. The loans are usually limited to £250 for the purchase of cows or heifers, £150 for the purchase of pedigree bulls, and £150 for small stock such as sheep, pigs, etc.

The amount outstanding on the 31st December, 1930, was £19,353, divided over 301 debtors.

It has hitherto only been necessary to write off about £25.

The Loan to Empire Settlers is similar in type to the Farm Development Loan, but is applicable only to Empire Settlers, and is wider in its scope.

The amount outstanding on the 31st December, 1930, was £9,824, divided over 61 loans, but these do not represent loans to 61 different individuals, as the same individuals have, in some cases, two or more loans.

Empire Settlers have also received loans from the Farm Development Fund, and this class of settler is also in receipt of loans in respect of permanent improvements and other assistance under the Empire Settlement Scheme.

The Irrigation Loans are made for the purpose of assisting farmers to construct water conservation and soil erosion protection schemes, and for the development of water supplies by means of boring.

Almost invariably these loans are secured by hypothecation of the property.

They bear interest at the rate of 6 per cent., and are usually spread over periods of from 5 to 10 years.

The loans outstanding on the 31st December, 1930, amount to £4,511, spread over 25 debtors.

The comparative smallness of the amount involved, which is considerably less than the sums authorised by Parliament, is possibly due to a lack of appreciation of facilities granted by the Government, but it is anticipated that the demands on these funds will be increased in the future.

The total capital indebtedness to the Department of Agriculture under these loan schemes, including balances due under the old scheme of loans to necessitous tobacco growers, is about £60,000, but this does not include amounts due in respect of cotton ginneries, and does not take into consideration sums due under the maize loan, sums due to the Lands Department, etc., which are very considerable.

It may be anticipated that the acute depression under which the farming industry is at present suffering will, although it is feared that many farmers will be unable to remain on the land, be productive of good in that the urgent attention of all producers has been forcibly drawn to the vital necessity of reducing their costs of production, and the future state of the agricultural industry may thus be better and more solvent than it has been in the past, and the necessity for these loans to farmers may, when world prices improve, become less apparent, and the business of financial assistance on any large scale may then become part of the ordinary business of banks and other institutions for provision of credits.

The reports of the Department annexed hereto, unless otherwise stated, are as follows:—

(1) The General Report by the Director of Agriculture.
(2) The Report of the Chief of the Division of Animal Industry.
(3) The Report of the Chief of the Division of Plant Industry.
(4) The Report of the Chief Irrigation Engineer.
(5) The Report of the Chief of the Division of Forestry.
(6) The Report of the Chief Chemist.
(7) The Report of the Chief Entomologist.

The Report by the Director, Department of Lands, and the Surveyor General, is printed separately, as is also the report by the Hydrographic Engineer, and the report by the Director of Veterinary Research.

ARTHUR C. BAGSHAWE,
Secretary,
Department of Agriculture and Lands.

Report of the Director of Agriculture, for the Year 1930.

Growing Season, 1929-30.—A hot spell which lasted for most of October and the early part of November was broken by fine rains over most of the Colony, and provided an excellent planting season, which continued favourable until after the middle of December. This was followed by a dry spell until the 11th January, which was broken for a time, to be followed by a second of about three weeks up to the 17th February. The growing season, which promised well to begin with, thus turned out to be a capricious and disappointing one. With the exception of a few isolated centres, the rainfall was considerably below the normal. Thus, up to the end of March, Salisbury was 7.4 inches, Bulawayo 5.5 inches, Gatooma 3.5 inches, Bindura 9.9 inches, Umtali 2.87 inches below the seasonal average, while Shamva was 4.4 inches above the normal. In some places the incidence of the rains was not too favourable. For instance, Eiffel Flats, near Gatooma, had 7.3 inches in 48 hours during 19th and 20th February. Owing to the late rains which fell in April in many parts of the country, the prospects of winter crops grown on wet vleis were excellent, and a record crop of wheat was anticipated in the Umvuma-Enkeldoorn area. Unfortunately this area experienced the severest frost on record during the middle of September, as a result of which it is estimated that at least 20 per cent. of the whole crop was lost.

As far as live stock were concerned, the season was a favourable one. Notwithstanding the fact that the rains were late in setting in during November, 1930, the late rains experienced in April and May enabled the cattle to carry over the winter in good condition and practically no losses were experienced.

Cattle.—It is disappointing to note that the number of European-owned cattle, which steadily increased up to 1925, has been slowly decreasing since that date. On the contrary, the increase in the number of native-owned cattle has steadily continued. The official figures for the last nine years are as follows:—

Cattle.	1921	1922	1923	1924	1925	1926	1927	1928	1929
European owned ...	905,040	936,251	993,608	1,003,629	1,006,086	991,216	956,522	905,383	902,163
Native owned ...	854,498	864,894	927,343	1,005,277	1,095,841	1,197,466	1,370,567	1,420,913	1,495,966

It is not possible to assign the steady decrease in the number of European-owned cattle to any one reason, but a number of contributory causes might be suggested. The chief one undoubtedly is the general feeling of uncertainty regarding the future of beef cattle in the country. In a number of cases the breeders of the better type of animals became so disheartened that they discontinued this line of business, and changed completely over to dairying or dairy ranching. Added to this feeling of uncertainty, the attraction of first tobacco growing and then cotton, which led to the booms in these crops, attracted many farmers from live stock, and in times of necessity cattle were disposed of to provide funds for what proved to be less reliable forms of farming.

The limited market for the better types of animals has had an important bearing on the position. Thus in 1930, 60,871 cattle were exported from Southern Rhodesia. Of this total 7,466 were sent to Johannesburg, and 320 on hoof to England, and these represent the total exports of better grades, *i.e.*, only 12.7 per cent. of that total. A further 21,775 were exported as dressed beef, chiefly to the Italian market, and a certain proportion of these was undoubtedly of a better class, but it is estimated that at least 75 per cent. of the total number of cattle exported were of the native type. If one reviews the cattle position of the world, there is nothing to indicate that the

future outlook is anything but hopeful. The examination of recent statistics indicates that for a number of years the cattle population of the main producing countries has been approximately stationary, but that the imports of beef and beef products into the U.S.A. and Canada have increased enormously. In Australia the cattle have been reduced in numbers, and in New Zealand and the Argentine there has been no increase in recent years.

The markets of Great Britain are those to which this country must look for the better type of cattle in the future. During the last few years small shipments of cattle on the hoof have been organised by a small group of farmers to whom great credit is due both for their enterprise and for the manner in which the shipments were organised. At the request of the farmers, the Department of Agriculture has now taken this over, and will arrange and organise all future shipments. For some years to come it will be necessary to send live cattle to England, but the aim of producers should be to increase the number of improved animals steadily until sufficient numbers are available to ensure regular shipments of chilled or frozen beef. The Government has given considerable assistance to the cattle industry. The bounty paid on dressed beef exported overseas has undoubtedly encouraged, if it has not actually been responsible for, the securing of the Italian contracts. During 1929, £25,000 was paid in bounty on dressed beef and £20,818 1s. 8d. in 1930. The bounty on cattle exported overseas on the hoof during 1930 amounted to £843 18s. 8d. This sum on 320 animals represents £2 2s. 8d. per head, which is approximately the nett return to the feeder. If the shipments of cattle on hoof are to be extended, and the industry is to be self-supporting—as it should be—it will be essential to reduce the costs of transport overseas very considerably. The freight paid on all animals shipped to date has been a flat rate of £10 per head, and the other costs and charges amount to approximately £4 per head. If larger numbers were available, and regular shipments could be arranged, it is anticipated that the freight could be reduced to about £6 per head, under which circumstances a bounty should not be necessary.

The Government Milk Recording Scheme.—Every country where dairying is carried out on a commercial scale has adopted a system of milk recording, and the majority have adopted the system first worked out in America. Under this system official milk recorders are employed by the Department to carry out the official and semi-official tests, and a small charge is made to help cover the cost of transport and equipment. The recorder makes periodic, usually monthly, visits to each farm on the records, and secures a complete record of the milk and butter-fat production of each animal on test, and also the feed consumption, feed cost and the gross income for each cow. These records are considered and an attempt is made to eliminate all cows that do not respond to intelligent feeding. The milk recording system has only been in operation for one complete year, and the number of farmers recording for the year 1930 under the semi-official scheme is only thirty-two, with 1,333 cows on test. Under the present rules it is essential that all the cows in the dairy herd must be put on test, so that by March, 1931, about 2,000 cows will be on the records. The charge for recording is 6d. per cow per month up to ten, and 3d. for each additional animal. Under the official milk recording scheme the recorder has to visit each farm every thirty days, and the test is extended over two days each visit. This applies particularly to breeders of dairy stock, and the charges are 2s. for each cow up to ten in number, with a minimum charge of £1 per visit, and 1s. for each additional animal. From the improvement which has been made in the herds under test this last year, it is anticipated that the scheme will continue to grow rapidly, and since considerable expenditure is necessary for this service, it is hoped that every breeder or farmer in dairy animals will support this scheme.

Union Dairy Control Act.—The Union Dairy Control Act, No. 35 of 1930, came into force as from the 1st October, 1930. The Act provides for the imposition of a levy on all butter and cheese manufactured in the Union and for the payment of a bounty on all dairy produce exported. This bounty

is given in order to maintain export prices at the same figure as internal prices. The Union Act makes provision for any adjoining State and territory to pass legislation similar to that passed by the Union, so that South Africa—south of the Zambesi—can be regarded, so far as the dairy industry is concerned, as one economic whole. With this idea in view, delegates from Bechuanaland, Southern Rhodesia, Basutoland, South-West Africa and Swaziland were invited to send delegates to a meeting held in Pretoria on the 17th and 18th September last, and, as a result, all these territories have made at least temporary arrangements to participate in the scheme.

At a meeting held in Gwelo on the 14th October of representatives of creamery interests in Southern Rhodesia, it was unanimously agreed, pending legislation, to adopt this principle of a voluntary levy on creamery butter. This will have the effect of maintaining the *status quo* between Southern Rhodesia and the Union of South Africa as regards creamery butter—that is to say, there will be reciprocal free trade in creamery butter between this Colony and the Union. At this meeting it was considered impossible without necessary legislation to adopt the principle of the levy on farm butter and cheese manufactured in Southern Rhodesia.

Rebate on Railage of Breeding Stock.—Prior to the end of July, 1930, the Railway Administration allowed a 50 per cent. rebate over its lines on pedigreed stock imported into the Colony. From the 25th July, this privilege was extended to cover all breeding stock, cattle, sheep and pigs, not only imported into the country, but also between any two points on the railway within the Colony. This fact was made public through the local press and the *Rhodesia Agricultural Journal.*

Staff Changes in Connection with Animal Husbandry.—The only change in connection with animal husbandry was the appointment of Dr. A. E. Romyn as Senior Animal Husbandry Officer. This appointment dates from the 8th April, 1930, replacing that of Stock Adviser, which fell vacant owing to the retirement of Mr. W. Fleming on the 31st July, 1930.

Sheep.—Except for a limited expansion in the north-eastern border area, the sheep industry in this Colony has shown very little growth during the last ten years.

The general experience is that sheep do fairly well in small flocks, but when the numbers increase, losses are heavy, and the flock becomes unprofitable. The Department of Agriculture has received many applications for assistance in establishing Merino sheep in different parts of the Colony, and a number of experiments have been carried out at different times with varying success.

The most important series of experiments started in August, 1926, when five were established. In this case the arrangement was that the Government would supply the sheep, fencing and dip tanks, and that the proceeds of the wool clip, after deducting any payments made for dosing materials and interest on the capital, would be allocated thus: Two-thirds in reduction of capital, and one-third to the farmer carrying out the experiment. An additional experiment was commenced at the Matopo School of Agriculture in April, 1929. In the five experiments one hundred ewes and three rams were purchased, and in the sixth, located in the Melsetter district, two hundred and three ewes and four rams, and the amount of capital expended varied from £350 to £530. At the end of 1930 only three of these experiments still remain, and the amount which has been written off is £505.

Constant requests are received from farmers for additional assistance in connection with woolled sheep, but before taking any further action in the matter, the Government decided to obtain a report from one of the senior sheep officers of the Union.

The Union Government was kind enough to second Mr. E. N. S. Warren, of the Grootfontein School of Agriculture, to carry out an investigation, and he was accompanied by Dr. A. E. Romyn, the Senior Animal Husbandry Officer, and Mr. D. A. Lawrence, of the Veterinary Research Laboratories.

The investigation was conducted during the months of August and September, and forty-seven farms were visited in different parts of the Colony, of which number one-third were in the Melsetter area.

On twelve farms *post-mortem* examinations were made by Mr. Lawrence, and a separate report was issued on the parasites which were found to be prevalent.

Mr. Warren's report was received on the 21st October, and was published in the *Agricultural Journal* during the early part of 1931.

CROPS.

Maize.—It is estimated that the area planted to maize for grain during the 1929-30 season was 340,000 acres, which is practically double the acreage planted in the 1919-20 season. The total yield is estimated at 1,774,700 bags, giving a yield per acre over the whole Colony of 5.22 bags. The average yield per acre during the previous season was 5.61 bags, and there is no doubt that the decrease was caused by the unfavourable season combined with an attack of army worm (*Laphygma exempta*, Walker).

Maize Control.—On the 25th April, 1930, during the last session of the Legislative Assembly, the Premier asked permission to make a statement.

This short statement outlined the Government's policy in regard to maize control and included two main points:—

(1) That a bounty up to 1s. per bag be made from revenue funds on every bag of maize or maize meal exported overseas from the Colony; provided that the total net price received by the exporter does not, including the amount of bounty, exceed 11s. 6d. a bag.

The provisions of this bounty to be for a period of one year only.

(2) In the meantime a full investigation to be made into the whole maize position.

In regard to the first point, the amount that has been paid as bounty up to the end of the year is £30,893 9s., being 1s. on 617,869 bags.

With regard to the second point, the Government endeavoured to secure the services of several well-known authorities from Great Britain, but without success, and finally arranged for a Committee of Enquiry under the chairmanship of Colonel G. N. Williams, D.S.O., Secretary for Agriculture of the Union of South Africa.

The committee appointed by the Minister of Agriculture and Lands consisted of the following members:—Lieut.-Colonel G. N. Williams, D.S.O., V.D. (chairman), Major R. H. Everett, C.B.E., Mr. Archibald Maclean, Mr. T. J. Needham (secretary).

The committee met in Salisbury on the 4th November and continued its sittings until the 28th November, on which date the report was handed to the Minister. The greater portion of this time was spent in Salisbury, but sessions were held in Shamva, Glendale, Bindura, Gwelo and Bulawayo.

The official report was published immediately, and was issued by the middle of December. This report furnishes a most valuable survey of the maize position, and will undoubtedly be of the utmost service to the maize growers of the Colony.

The Maize Loans Committee.—During September, when the slump in the export price of maize was fully realised, urgent representations were made to the Government on behalf of the maize growers by the Rhodesia Agricultural Union, the Maize Association and the directors of the Farmers' Co-op., Limited.

The position as indicated was extremely grave, and the deputation informed the Government that 90 per cent. of the growers were bankrupt, and it was impossible for them to obtain the necessary assistance from the banks to enable them to plant crops for the coming season. Notwithstanding

the fact that the Government at the beginning of the season had undertaken to pay 1s. per bag bounty on all maize exported, provided the selling price overseas was less than 11s. 6d. per bag, the Farmers' Co-op.'s pay-out had only reached 5s., and there was but slight probability of any further payment.

On the 21st October the Government decided to make advances on the following bases:—

(1) The advances to be limited to such amount as, added to the price received on account of the past season's crop, will give to the grower a total amount of 8s. per bag.

The committee, however, will be vested with discretion to increase the advance by not more than 50 per cent. to growers who adopt sound methods of agriculture, including green manuring, etc.

(2) Each advance to be made on the basis of the total number of bags sold by the grower from the past season's crop.

(3) Advances to be granted only to growers who are able to show that they require assistance to enable them to carry on their farming operations for the coming year.

(4) Loans to be free of all interest.

(5) Loans to be granted on the security of three bags of maize for each £1 advanced, one bag per annum to be delivered to the Farmers' Co-op. for the next three years, or, at the option of the grower, a cash payment of 6s. 8d. per annum for three years.

(6) Any debtor who gives up farming operations or becomes insolvent to be liable for the balance of the loan in cash.

(7) A committee to be appointed to deal with applications for these loans, and to be vested with full discretion in the granting thereof.

(8) The Loans Committee to have full power to call for certificates and signed balance sheets and financial statements.

(9) The Loans Committee consisted of:—
Major H. R. Everett, C.B.E.
Mr. H. G. Mundy, with
Mr. A. W. Redfern to advise.
Captain E. Burt as secretary.

The Maize Loans Committee sat for one month, and in addition to Salisbury visited the following centres:—Amandas, Bindura, Shamva, Glendale, Banket, Sinoia, Hartley, Gatooma and Gwelo.

Operations of the Maize Loans Committee.—Loans amounting to a sum of £52,291 were definitely approved. The maximum sum approved for any applicant has been £500, and 12 farmers have benefited to this extent. Fifteen maize growers have received loans of between £400 and £500, 22 growers of sums between £300 and £400, 46 growers of sums between £200 and £300, 74 growers between £100 and £200, and 91 farmers have been advanced sums of less than £100.

In all 353 applications were dealt with by the committee, and of these 260 were approved. Of the remainder, 68 were refused and 25 withdrawn.

Loans have been dispensed by districts as follows:—

Mazoe	£33,709	amongst	128	growers.
Lomagundi	7,967	,,	54	,,
Hartley	2,430	,,	24	,,
Salisbury	7,513	,,	42	,,
Midlands	412	,,	7	,,
Various	260	,,	5	,,
	£52,291	,,	260	,,

Wheat.—It is estimated that the acreage planted to wheat during the winter of 1930 was about 6,000 acres and the total yield only approximately 12,000 bags, owing to the unusually late frost which occurred during the middle of September. It is difficult to estimate the total loss due to this cause, but there is not the slightest doubt that in some of the lower lying vleis the damage amounted to from 40 per cent. to 50 per cent. of the possible crop.

The development of winter-grown wheat on wet vleis reached its highest point during 1921, and it is estimated that a crop of 28,400 bags was produced from 7,118 acres. The amount produced in 1924 had fallen to 5,471 bags, and fluctuated from about 11,000 to 6,000 in 1928.

During 1928 the Government agreed to allow a rebate of the Customs duty on imported wheat to be milled in the country, provided that the finished product contained not less than 25 per cent. of the wheat produced in the Colony. In view of this a conference of producers and millers was called, and the latter undertook to stabilise the price of locally grown wheat at 27s. 6d. per bag for the next few years, and this action has had an important bearing on the increased interest taken in this crop during the last two years.

Tobacco.—During the year under review there has to be recorded again a falling-off in the acreage planted to tobacco and also in the estimated production of the crop, but there has undoubtedly been a noticeable improvement in the quality as compared with the past two seasons.

Tobacco Growers' Delegation to England.—On the 30th and 31st October, 1929, a conference of delegates representative of the tobacco growers of Northern Rhodesia, Nyasaland and Southern Rhodesia met in Salisbury. Many points of great interest to the tobacco industry were discussed, and decisions of considerable importance arrived at. The resolutions dealing with the proposed delegation to London read as follows:—

(a) "That immediate steps be taken by the representatives of Northern and Southern Rhodesia and Nyasaland to appoint delegates to proceed to London for the purpose of approaching the Dominions office, with a view to representing the position of growers, and to find means to expedite the consumption of Empire tobacco in the United Kingdom market, and that other Empire tobacco-producing countries be invited to co-operate in this movement."

(b) "That it be an instruction to the delegates from these provinces to investigate, on the spot, the means of creating a London Committee and Secretariat, directly responsible to the Growers' Association."

It was realised that there are various organisations in London, including the Empire Marketing Board and the British Empire Producers' Organisation, taking great interest in the encouragement of the use of Empire tobacco, and that this matter should be left to the delegation to make the most desirable arrangements when in London. Arising out of this conference a request was submitted to the Government for financial assistance for two delegates from this Colony to form part of the combined delegation, and the Government decided to grant assistance, provided the Governments of Northern Rhodesia and Nyasaland also participated.

His Excellency the Governor approached the Government of other Colonies and Dominions with a request that they should appoint representatives of the growers of the Colonies concerned to join in an endeavour to find means to expedite the consumption of Empire tobacco in the United Kingdom. The Government also asked the High Commissioner to render all assistance possible to the delegation, and decided to grant a sum of £500 towards the expenses of the delegation. Considerable delay occurred in completing the preliminary arrangements, and it was not until the 10th April that the delegation was definitely organised, and Major L. N. Hastings and Mr. P. H. Gresson were accepted as the delegates representing the tobacco growers

from this Colony. The latter had meanwhile proceeded to England on business, and Major Hastings left at the beginning of July.

On arrival in England, representatives of Canada, the Union of South Africa, Kenya, Tanganyika, Uganda, Cyprus, Mauritius, Jamaica and British North Borneo met in London with the members from Northern and Southern Rhodesia and Nyasaland, and decided to form in London a Federation of Tobacco Growers of the Empire. Major Walter Elliot, M.C., M.P., consented to act as president of the federation, and Mr. Harold T. Pooley, a director of the British Empire Producers' Organisation, as the honorary secretary.

A deputation of the 14 Empire tobacco producing territories waited on the Dominions and Colonial Office on the 22nd October, 1930, and the whole question of Empire tobacco was thoroughly discussed. Major Hastings and Mr. Gresson returned to Salisbury in December, and presented their preliminary report to the executive of the Tobacco Association in Salisbury on Friday, the 19th, and to the Minister on the 22nd December.

It is anticipated that the results of this delegation will have an important bearing on the development of the tobacco industry in all parts of the Empire, and that the permanent organisation established in London will serve a very useful purpose in furthering the use of Empire tobacco in the markets of the United Kingdom.

Tobacco Control Board.—Under the new Customs Agreement completed between Southern Rhodesia and the Union of South Africa on the 13th February, 1930, the importation of tobacco into the Union or Southern Rhodesia is dealt with under Article VI. This allows during each period of 12 months ending on the 30th June, 2,000,000 lbs. weight of Virginia type tobacco, and 400,000 lbs. weight of Turkish type tobacco grown in Southern Rhodesia to be imported into the Union duty free. Further, during each such period 150,000 lbs. weight of tobacco grown in the Union may be imported free of duty into Southern Rhodesia.

As far as tobacco is concerned, the new agreement came into force from the 1st January, 1930, and remains in force until the 30th June, 1932, and thereafter from year to year unless notice is given by one of the parties concerned of its intention to retire from the agreement.

On the 6th June, 1930, the "Tobacco Sale and Export Control Act, 1930," was promulgated, and provided for a board to regulate and control the sale and export of tobacco produced in Southern Rhodesia, and referred chiefly to duty free tobacco for which provision was made under the new Customs Agreement. The regulations necessary under this Act appeared in Government Notice No. 380, of the 13th June, and the Control Board was appointed as from the 6th June. The funds for working expenses were provided by the Land and Agricultural Bank under a temporary advance of £5,000 provided by the Government. Interest at the rate of 6 per cent. was charged, and the funds could only be used for working expenses.

Cotton.—The 1929-30 season opened moderately well for cotton, but the crop was checked by the dry spells which occurred in January and February. A large amount of this cotton was, therefore, delayed in maturing owing to this, with the result that a considerable proportion of the crop suffered from American boll worm injury. In spite of this fact, however, there were a number of exceptionally good crops throughout the country. The average yield per acre leaves much to be desired, although it shows a decided advance on previous years, with the exception of the 1923-24 season.

Formerly, when cotton was grown in Southern Rhodesia a certain amount of difficulty was encountered in marketing the crop, and in order to provide an additional outlet the services were enlisted of the Central Co-operative Cotton Exchange, Limited, Durban. This organisation consists of a federation of co-operative ginneries in the Union of South Africa, the two Rhodesias and Swaziland. The three co-operative ginneries in

Southern Rhodesia are affiliated to the Central Co-operative Cotton Exchange, Limited, and it is satisfactory to record that despite the low prices which now rule for cotton the whole output of the two co-operative ginneries in this country was handled by them and every bale sold. This has enabled prompt settlement of accounts—a very welcome feature in view of the very difficult selling conditions which prevailed last season.

The Cotton Specialist's report reviews the year's activities thoroughly and indicates that definite progress has been made, which promises well for a rapid development in cotton growing during the next few years.

Ground Nuts.—The acreage planted to ground nuts is steadily increasing. During 1927-28 season the total acreage planted was 6,882 acres, with a total estimated yield of 51,220 bags. During the 1928-29 season the acreage was 9,674 acres and the total yield 69,926 bags. Unfortunately the figures for 1929-30 are not yet available.

During July it was learnt from the High Commissioner that the Conference Lines had agreed to a reduction in the freight on ground nuts from 86s. 9d. per 20 cwts. in shells to 76s. 9d. or 30s. per 40 cubic feet, and for the shelled nuts from 54s. 3d. per 20 cwts. to 44s. 3d.

Potatoes and Sweet Potatoes.—During 1929 the acreage planted to potatoes was slightly over 10 per cent. less than that of the previous year. It is estimated that 2,807 acres were planted in 1927-28 season and the winter of 1928, with a total yield of 56,734 bags. The 1929 figures are 2,484 acres and 50,557 bags.

The seed potato crop, on the other hand, showed approximately a 20 per cent. increase. In 1927-28 12,029 bags were produced from 65 acres, and in 1928-29 15,896 bags from 891 acres.

Sunflowers.—The acreage planted to sunflowers has shown a very considerable increase during the last few years, particularly that planted as a green manure crop.

The total acreage for the season 1926-27 was 3,261 acres, for 1927-28 5,893, and for 1928-29 10,824 acres.

Legumes.—

	Sunn hemp.	Dolichos beans.	Velvet beans.
1926-27	917	1,258	2,863
1927-28	1,836	1,961	2,628
1928-29	5,479	3,068	3,201

Total Legumes.—

1926-27	12,425
1927-28	13,251
1928-29	19,690

It is estimated from the returns sent in by farmers that of the total legumes grown 8,093 acres were ploughed-in as green manure during the season 1926-27, 8,566 during 1927-28 and 15,986 during 1928-29.

Oats.—During the season 1927-28 and the winter of 1928 it is estimated that 2,187 acres were planted to oats, chiefly for forage. Slightly over 1,000 bags of seed were reaped and 1,265 tons of oat hay produced. During 1928-29 and the winter of 1929 this acreage was increased to 2,854 acres, and approximately 2,000 bags of seed reaped and 2,217 tons of forage produced.

Barley.—The acreage planted to barley has shown a gradual increase during the last few years, and about 50 per cent. of that grown is reaped for seed and the remainder utilised as fodder.

The estimated figures are as follows:—

	Acres planted.	Seed (bags).	Fodder (tons).
1927	815	2,126	648
1928	950	3,330	769
1929	1,155	3,917	1,108

Coffee.—In the early days of the occupation of Southern Rhodesia by Europeans, many small plantings of coffee took place along the eastern

border from Umtali to Chipinga. In almost every case this was done by settlers who had no knowledge of coffee growing, nor of the requirements of the crop. The natural result was that in many cases unsuitable sites were chosen, and the coffee leaf disease (*Hemeleia vastratrix*) took a large proportion of the struggling trees until practically all had disappeared. The interest in the crop has never dwindled, and the Department has been called upon to supply seed on many occasions, and free issues have been made to many farmers during the last fifteen years. In many cases the recipients either failed to carry out the instructions issued by the Department or allowed the plants to die for want of attention, but in a few cases very promising results have been obtained.

During the latter half of 1929, the Mozambique authorities engaged Mr. M. D. le Poer Trench, a coffee planter in Kenya, and the former Coffee Adviser of that Colony, to make a report on the coffee possibilities of that territory. After spending about three and a half months on this work, Mr. Trench was asked to report on the eastern border, and his report was received in January, 1930. Owing to the fact that the Horticulturist was on leave, Mr. Trench was accompanied by the Plant Pathologist, and visited 34 farms in all.

The following extract from Mr. Trench's report might be quoted:—

> "I strongly advise that a system of registration of plantations should be adopted, and that all farms should be periodically inspected by an officer of the Department of Agriculture. All neglected or abandoned coffee trees should be destroyed, as they constitute a menace to neighbouring plantations, and eventually to the whole coffee area."

It might be argued that such action is not warranted while the industry is on so small a scale, but the fact is that considerable danger exists at the present time. In Mr. Trench's report on one of the farms in Mount Silinda area, he reported finding a few coffee trees in a completely neglected condition. There may be many other such cases of which nothing is known, and the risk from neglected trees is certainly sufficiently great to warrant compulsory registration of even small plantations.

Pasture Research.—During the last ten years a large amount of attention has been paid to the problems connected with pasture improvement. This does not only refer to new, or what might be called unimproved areas, but applies to pasture lands in every part of the world.

The southern part of Africa is likely to play an important part in pasture investigations on the continent in the next few years because of its wonderful variety of soils and climate and its range of altitudes.

The Union Government has been carrying out most important researches in regard to its pasture problems in different areas, and in November, 1929, a start was made in this Colony with the financial assistance of the Empire Marketing Board.

Southern Rhodesia was allotted a definite section of the investigations which have been laid down in different parts of the Empire, and a sum of £2,500 towards capital costs and a similar amount annually for three years was promised by the Empire Marketing Board, provided that this Government subscribes a like amount.

This particular series of experiments was planned by the Chief Chemist of this Department in consultation with the Rowett Institute at Aberdeen, and the results obtained will be considered in conjunction with those from all other centres operating under the Empire research scheme.

In this way results can be anticipated which will be of the utmost interest, not only to the countries participating, but to the scientific world generally.

The objects of the experiments may be stated briefly as follows:—

(1) To determine the influence of mineral supplements to the rations of ranching cattle and dairy cows.

(2) To determine whether it is more economical to supply the minerals direct to the animals in the form of salt, bone meal, etc., or through the soil to the grasses and then to the animals.

(3) To determine the most economical method of improving the feeding value of the natural grasses.

Evidence is not lacking that many of the symptoms of malnutrition usually associated with mineral deficiencies are prevalent in many parts of the Colony.

The experimental plots which have now been established at the Matopo School of Agriculture and at the Sand Veld Research Farm, Marandellas, will undoubtedly furnish a good deal of valuable information on this subject, and the details of the work already carried out there will be found in the Chief Chemist's report.

Sericulture.—During 1929 the Government was informed that several African territories had approached the Imperial Institute to secure the services of an authority on sericulture to report regarding the possibilities under the conditions in those areas.

Southern Rhodesia was invited to participate, and Mr. Norman Breton, the chairman of the Advisory Board on Sericulture to the Imperial Institute, arrived in Salisbury on the 14th January, 1930. Mr. Breton, who was accompanied by his son, was only able to spend a month in the Colony. The main points of Mr. Breton's report were published in the *Agricultural Journal* during December, 1930, and January, 1931.

Locusts.—Towards the end of November, locusts appeared in Northern Rhodesia, and were reported from the Wankie district. One swarm flew across the river near the Victoria Falls on the 30th November, travelling in the direction of Bechuanaland, and on the 1st December a second swarm was reported passing over Waterford farm, near Kezi. The locust concerned was the red-wing locust (*Nomadacris septemfasciata*), which species has not been seen in this Colony since 1910. Preparations were made to deal with any hatchings of hoppers that might occur, but it would appear that no egg-laying took place in the country, and no further action was therefore necessary.

Matopo School of Agriculture.—The agricultural school at Matopos was started from the 1st January, 1930, when seven students entered for the two years' diploma course in agriculture. During the year Dr. D. G. Haylett was appointed as principal, and Mr. C. A. Murray as lecturer in animal husbandry. At the end of the year it was decided to close down the junior school, and the institution will now be utilised for the two-year diploma course and for short or special courses to farmers and teachers. The teaching staff for the present will be supplemented by departmental officers, who will conduct short courses in the different specialised subjects. The institution will carry out investigations chiefly in connection with live stock and the growing of suitable feed stuffs, and will act as a centre from which extension work can be conducted in the Matabeleland areas.

Reports of Divisions and Branches.—In order to reduce the annual report as far as possible, abridged reports of the divisions and branches only are printed this year. Extracts from the full reports will, however, be published in the *Agricultural Journal* so as to maintain the continuity of the records.

The Agricultural Journal.—The report of the editor indicates that the Journal of the Department has been continued in its usual form at an actual cost to the Government of approximately £742.

The reduced returns received by farmers is reflected in the reduced number of subscribers, which is 1,376 at the end of 1930, *i.e.*, 300 less than at the end of 1929. The number of appreciative letters received during the

year indicates that the Journal serves a very useful purpose, and representing as it does the only source of exchange literature, it enables the Department to keep in touch with the work carried out in other countries.

Agricultural Legislation.—Two Bills affecting agriculture were passed during the year:—

(1) The amendment of the "Brands Ordinance, 1900," which made it possible, with the consent of the Minister, to allot special brands to owners of cattle, to be used on cattle intended for export, in addition to other brands registered under the Ordinance.

(2) The Tobacco Sale and Export Control Act, which provided for a board to regulate and control the sale and export of tobacco produced in Southern Rhodesia.

Acknowledgments.—In the discharge of its many functions, this Department makes numerous calls on other sections of the Government Service and on organised bodies connected with agriculture for co-operation and assistance.

It is a pleasure to record the whole-hearted support which has been given by the Union Government, the representatives of the Rhodesia Agricultural Union, the Rhodesia Tobacco Association, the Rhodesia Egg Circle, the creameries and the Tobacco Control Board.

To all of the members of the Department my thanks are also due for the co-operation which has been so willingly given.

CHAS. K. BRAIN,
Director of Agriculture.

Report of the Chief, Division of Animal Industry, for the Year 1930.

I have the honour to submit my report on the work of the Veterinary Department for the year ending 31st December, 1930. The report of the Senior Animal Husbandry Officer is attached.

Staff.—It is with the greatest regret that the death of Captain J. Park Hamilton, District Veterinary Surgeon, Gwelo, has to be recorded, and it is desired to place on record an appreciation of his valuable services to the Department and of the courtesy and tact with which he always carried out his duties.

At the beginning of the year the number of cattle inspectors employed, including men for special work in connection with African Coast Fever, was 77, and at the end of the year this had been reduced to 65.

Re-organisation.—As part of the general scheme of re-organisation of the Department of Agriculture which was effected in December, a Division of Animal Industry was created, comprising all administrative and field veterinary services, animal husbandry and the dairy and poultry branches. The Chief Veterinary Surgeon was appointed chief of this division.

General.—The conditions generally throughout the year were very favourable for stock. Good rains in the earlier months resulted in ample grazing and water supplies, and notwithstanding an exceptionally severe winter, stock carried over well, the losses from poverty being considerably less than for several years past. Plentiful rains fell in November and December, and stock rapidly regained condition.

The total number of cattle exported on the hoof shows a decrease of nearly 13,000 as compared with the previous year, due chiefly to the falling off in overseas export in cold storage via Durban. The numbers of cattle forwarded to Johannesburg for slaughter purposes are practically the same, whilst to the Congo there is a slight increase. A new market for slaughter cattle was opened up at the copper fields in Northern Rhodesia, to which 3,597 head were forwarded on the hoof. The export of frozen and chilled meat and other animal products to the Belgian Congo was well maintained. It is hoped that this trade will be further developed, as the long railway journey for live animals causes considerable wastage and loss through damaged flesh, as well as entailing a certain amount of unavoidable hardship and suffering on the animals.

The number of pigs exported shows a substantial increase.

Importations of cattle for breeding purposes show a very marked decrease. The increasing interest in the sheep industry is shown by an increase of over 7,000 in the number of sheep and goats imported, due chiefly to large importations of sheep for breeding purposes.

DISEASES OF CATTLE.

African Coast Fever.—

Melsetter District.—At the beginning of the year there were seven infected farms, and the only infection manifested on these during the year was one case on the farm Wolfscrag. In January *post-mortem* and microscopic examinations of a beast on the farm Schaapplaats showed Coast Fever. Although this is scheduled as a fresh outbreak, there is good reason for believing that infection first occurred in October, 1929, but as microscopic examinations were negative, no steps were taken beyond keeping the herd under close observation. When the existence of infection was definitely determined, the cattle were valued and taken over by the Department for slaughter, the owner being compensated to the extent of 75 per cent. of the valuation. In February, on the occurrence of the case of disease on Wolfscrag referred to above, similar steps were taken. The

Morgenson and Enhoek infected herds, which had been taken over for slaughter in October, 1929, were moved to the farm Canterbury in January in accordance with the arrangements made with the owners. The slaughter of these herds had been proceeding slowly, the meat being disposed of locally, and arrangements had been made for speeding up the work by forwarding meat to Umtali as soon as the weather became cold enough. When the Schaapplaats and Wolfscrag herds were added to the number for slaughter, it at once became evident that the operations could not be completed by the end of the cold weather, and it was decided to forward the balance of the three herds to Umtali by road, and thence by rail to the Cold Storage abattoirs at Bulawayo. To ensure that this movement should be effected with the greatest safety, the cattle were moved to the farm Vleiplaats, on which Coast Fever had never occurred, temperatured daily for four weeks, and were then despatched to Bulawayo. These operations were started on 7th July and were satisfactorily completed before the end of September.

The position in the district at the end of the year was that there were no cattle on infected veld, and that there were two farms only on which disease had occurred during the year.

Mazoe District.—No fresh outbreaks occurred, and the only mortality at the previously infected centres was four head on the Chiweshe Reserve. The slaughter of the remaining cattle on Villa Franca and the infected section of the Chiweshe Reserve was completed in March.

Charter District.—At the beginning of the year there was one infected farm, on which the cattle had been slaughtered in September, 1929. This farm was released from quarantine at the end of the year. In February an outbreak occurred on the farm Inhoek, and the infected herd was slaughtered immediately. A second herd, consisting of working oxen and dairy cattle, was allowed to remain, on the assumption that the paddock in which the animals had been running had not become infected. This unfortunately proved to be incorrect, as several cases occurred during the last week in July. All animals were slaughtered within 14 days. This farm had been the seat of a previous outbreak, when the last death from Coast Fever was recorded in March, 1925.

Gwanda District.—No active centres of infection or quarantined areas were carried over from the previous year, but in February a case of Coast Fever was diagnosed on the farm Deneys, adjoining the Gwanda commonage. All the cattle on the farm were valued and taken over for slaughter, which was accomplished by railing them to the Cold Storage abattoirs at Bulawayo. Daily temperaturing was carried out until despatch, and during this process four cases of Coast Fever were detected. It is fortunate that there had been very few movements of cattle from or through this farm for a considerable period prior to the discovery of infection. All such movements were followed up, but no evidence of any infection resulting from them was forthcoming. This outbreak shows that Coast Fever infection may remain for a long period without any obvious manifestation of its existence. In June, 1927, a calf was found dead on Deneys, and spleen smears were taken and forwarded for examination. Unfortunately the carcase was far advanced in decomposition, and the microscopic examinations were unsatisfactory, but the report stated that the case was highly suspicious of Coast Fever. The farm was fenced, quarantine imposed and short interval dipping instituted. The quarantine was raised in July, 1928, and thereafter no cases of sickness or mortality were reported. It has since been ascertained that losses did occur, especially amongst the dry cattle that were allowed to run night and day and only collected for dipping purposes. There can be no doubt that the infection existed from the date of the death of the calf in June, 1927. Obviously it was mild to begin with, and there is no doubt that it remained during the period of quarantine and short interval dipping. The somewhat uncertain diagnosis of Coast Fever in the case of the calf in 1927, and the fact that more definite evidence of

the existence of infection was not forthcoming, led to severe criticism and dissatisfaction at the restrictions and dipping operations which necessarily follow an outbreak of disease. It was freely alleged that the diagnosis was wrong, and several instances were quoted where a solitary case of disease, diagnosed microscopically, was not followed by any further mortality, and that as no such mortality occurred, the disease could not have existed. The Deneys case affords further proof, if such were necessary, of the reliability of microscopic diagnosis in African Coast Fever.

In this connection the opportunity is taken of recording some details of the course of African Coast Fever in Matabeleland during the last ten years. The following table shows the number of outbreaks and the mortality. Prior to the 1924 outbreak there had been no infection for over three years.

Year.	No. of fresh outbreaks.	Mortality at all centres.
1924	1	37
1925	6	25
1926	12	2,882
1927	17	1,274
1928	1	2
1929	Nil	Nil
1930	1	5
	Total	4,225

The total number of cattle involved was approximately 56,597 head.

Early in 1927, in consequence of the very heavy mortality which had occurred in the Essexvale section of the Umzingwane district during the latter half of 1926, and as it appeared that infection had been disseminated from this section over a much wider extent of country than was anticipated, a system of intensive supervision of cattle and dipping was organised over the greater part of Matabeleland. The results of this system will be appreciated from the fact that although 18,413 head of cattle were involved in the 17 fresh outbreaks which occurred during 1927, the total mortality was only 79. The following year there was one fresh outbreak involving over 7,000 head in which the total mortality was 1. The simple and obvious explanation of these satisfactory results is that all the later outbreaks were detected at the very earliest stage possible.

Anthrax.—During the year there were eleven outbreaks of anthrax amongst cattle, of which eight occurred on areas not known to have been infected previously. The total mortality was 71 head. All animals in contact, about 6,000 head, were vaccinated with spore vaccine.

At Sandown Siding a Persian ram imported from the Union died from anthrax a few minutes after leaving the truck.

Quarter Evil.—In the Bulawayo veterinary district quarter evil was more prevalent than during the previous year and there was a considerable increase in the demand for vaccine. In other districts the mortality was slight.

Tuberculosis.—Only one case, a bull in the Gwelo district, occurred in the Colony during the year. At the Bulawayo quarantine station 625 head were tested with tuberculin on importation; six head reacted and were slaughtered.

Heartwater in Cattle.—This disease exists on several areas in the Bulawayo veterinary district, viz.: In the vicinity of Gwaai station, Nyamandhlovu district: Gwanda district south of the railway line, and the southern portion of the Matobo district, and appears to be extending gradually.

Trypanosomiasis.—In the Melsetter district 98 head of cattle on 15 farms died from trypanosomiasis, and 89 of these deaths occurred during

the months January to April inclusive. The heaviest mortality in any month was 34 in April. Assistant Veterinary Surgeon Adamson remarks as follows:

> "On the assumption that only 5 per cent. of tsetse flies are capable of transmitting the disease, we have an approximate number of 2,000 tsetse flies which must have been in the district to cause this mortality, assuming that one fly passed the disease to one animal only. This latter assumption is scarcely justifiable, as it is stated that once a fly is infected it remains so for the rest of its life. Still, to cause such a large number of cases of trypanosomiasis a large number of flies must have been present on these farms, but none was observed. On farms associated with the disease several species of tabanids have been taken, and the presence of these and the absence of tsetse points with suspicion to tabanids being the vector of the infection."

In the Hartley and Lomagundi districts a system of treating infected cattle was instituted with the object of assisting certain farmers in the tsetse fly areas to carry on their farming operations with oxen. A fenced area was provided in each district to which infected oxen are drafted for periodic intravenous injections of antimony potassium tartrate, and when sufficiently recovered for work they are returned to the owners. The scheme has not been in operation long enough to form any conclusions as to its value. The mortality in cattle recorded in these districts was 80 head, but this does not represent the entire mortality from trypanosomiasis.

In the Darwin district a number of cattle died from trypanosomiasis, but exact figures were not obtainable. A similar observation applies to certain areas in the Wankie and Bubi districts.

Cutaneous Myiasis (Screw Worm of Cattle).—Generally this affection was not so prevalent, but in certain areas there was a marked increase and in several instances this was associated with the relaxation of dipping for long periods on account of shortage of grass and water. Various officers of the department who have been engaged on the intensive supervision of dipping for African Coast Fever purposes state definitely that regular and proper dipping reduces the incidence of screw worm in a very unmistakable manner. When bont-legged ticks are prevalent it is recommended that dipping at five-day intervals, with hand dressing, be resorted to.

Contagious Abortion of Cattle.—This disease is enzootic throughout the Colony, but as cattle owners rarely report its existence amongst their herds it is impossible to form an estimate of the losses occasioned by it.

Sweating Sickness in Calves.—On the whole this disease appears to be decreasing and recoveries are more frequent than formerly. During the early part of the year it was prevalent in the Victoria district, otherwise very few cases were reported.

Redwater and Gallsickness.—A slight mortality occurs every year from these diseases, which are enzootic, and chiefly amongst imported animals. Occasionally severe outbreaks are seen in locally-bred stock, due to neglect in the use of the dipping tank.

Distomiasis.—Distomiasis, or fluke disease in cattle, exists to a considerable extent in several districts. Most satisfactory results have been obtained from treatment by carbon tetrachloride.

Glanders.—The Colony remains free from this disease. The mallein test was applied with negative results to 1,359 equines imported during the year.

Horse Sickness.—The mortality reported from this disease was 34 head, compared with 122 during the previous year. Although this figure does not represent the total mortality, it is evident that infection was very mild.

Scab in Sheep.—Twelve outbreaks of scab in European-owned flocks were dealt with. A close inspection of native flocks throughout the Colony showed that, with the exception of two areas in Matabeleland, they were remarkably free from scab.

Schedules.—The following schedules are attached, viz.:—

(a) The number of cattle and cattle dipping tanks in the respective veterinary districts.

(b) The mortality from African Coast Fever.

(c) The numbers of live stock imported and exported.

(d) Meat and other animal products exported in cold storage.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Salisbury,
9th February, 1931.

RETURN OF CATTLE AND DIPPING TANKS.

Veterinary District.	No. of Tanks.	No. of Cattle.
Salisbury East	513	249,805
Salisbury West	503	199,357
Umtali	254	123,926
Melsetter	127	53,033
Fort Victoria	305	456,088
Gwelo	562	450,714
Bulawayo	858	996,979
	3,122	2,529,902

AFRICAN COAST FEVER.

Infected Areas and Mortality, 1930.

District.	Area.	No. of Cattle.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Mortality.	
															1930	Total.
	Existing Outbreaks—															
Melsetter ...	Enhoek and Morgenson	904	...	...	...	...	...	...	...	...	*x*	...	...	...	...	53
	Wolfscrag	252	1	...	...	...	...	...	...	...	*x*	...	...	...	1	2
Mazoe ...	Villa Franca... ...	212	...	...	*x*	...	...	...	...	...	...	...	...	...	...	1
	Chiweshe Reserve ...	345	4	...	*x*	...	...	...	...	...	...	...	...	...	4	9
	Fresh Outbreaks—															
Melsetter ...	Schaapplaats... ...	493	1	...	...	...	...	1	...	...	*x*	...	...	...	2	2
Charter ...	Inhoek	(1)198	...	9	6	1	*x*	...	...	...	...	...	...	...	16	16
		(2) 58	...	...	...	...	...	...	2	10*x*	...	...	...	...	12	12
Gwanda ...	Deneys	420	...	3	2	x	...	...	...	...	...	...	...	...	5	5

x Herd destroyed.

IMPORTATIONS: MISCELLANEOUS.

	Bulls.	Cows and Heifers.	Sheep and Goats.	Horses.	Mules.	Donkeys.	Pigs.
From United Kingdom	15	9	—	—	—	—	—
From Union of South Africa	346	554	33,223	215	139	896	193
Totals	361	563	33,223	215	139	896	193

EXPORT OF CATTLE, 1930.

Union.		England.	Congo.		Northern Rhodesia.			Portuguese East Africa.	Totals.
For local consumption.	I.C.S.	Slaughter (on hoof)	Slaughter.	Breeding	Slaughter.	Breeding.	Trek oxen.	Breeding.	
Slaughter.	For overseas.								
7,466	21,775	320	24,093	3,143	3,597	324	128	25	60,871

EXPORTATIONS: MISCELLANEOUS.

	Sheep and Goats.	Horses.	Mules.	Pigs.
Union of South Africa	56	6	—	943
Northern Rhodesia	3,136	1	—	1,003
Belgian Congo	571	6	2	2,545
Portuguese East Africa	157	2	—	—
Totals	3,920	15	2	4,491

EXPORTS IN COLD STORAGE TO NORTHERN RHODESIA AND THE BELGIAN CONGO.

Carcases.				Beef quarters.	Livers.	Tongues.	Hearts.	Brains.	Tails.	Tripes.	Heads.	Feet.	Plucks.	Cheeks.	Kidneys.	Pork trimmings.
Beef.	Sheep.	Veal.	Pigs.													
*2,905	355	144	144	31	1,597	1,735	1,522	577	2,193	1,631	115	58	59	317	394	220 lbs.

*Including 40½ carcases exported for consumption overseas.

Report of the Senior Officer in Animal Husbandry for the Year 1930.

1. BEEF PRODUCTION.

(a) General.—The year on the whole has been a good one, and it is encouraging to note a return of confidence in the cattle industry. The industry is re-acting now to the depression of 1922 and 1923, and the low prices at present ruling for agricultural products have served to emphasise the relative security of cattle farming in this Colony.

(b) Bounty on Cattle Exported.—During 1930 a bounty of £20,818 was paid out on dressed beef, and £849 on cattle exported on the hoof. These bounties have served to encourage export and to maintain prices on the local market. They have, however, tended to create a somewhat false sense of security, and to obscure the main issue that only through a general improvement in the quality of the cattle can a stable export trade be achieved.

(c) Export Cattle on the Hoof.—During the year 320 head of cattle were exported overseas on the hoof, and arrangements have been completed for the export of 1,060 head early in 1931. The expansion of this trade is one of the most encouraging features of the industry, but the costs of export and marketing will have to be reduced considerably before the export of these steers becomes a sound commercial risk.

There is a shortage of suitable bullocks for export. The shortage in Mashonaland is acute, and breeders there will in the future have probably to produce more of their own stores rather than rely on Matabeleland, where many breeders are likely to fatten their own bullocks.

(d) Cattle.—My acquaintance with the cattle in this territory is limited to a few months. The considered opinion of cattlemen, however, appears to incline to the view that there has been no improvement in the quality of beef cattle in this Colony during the last ten years. There has been little incentive for improvement, but one of the chief reasons for the lack of advancement has been the growth of indiscriminate dairying and dairy ranching, with the resultant under-nourishment of the calves. The cattle industry has been much harmed by the misuse of the cream separator, and there is little likelihood that the standard of quality required for export to the United Kingdom will generally be reached until the practice of over-milking cows is discontinued.

2. DAIRYING.

(a) General.—Despite a dry year in Matabeleland, the season in the Colony has been good and prices for dairy products satisfactory. There has been a keen demand for dairy cattle of good quality, and breeders in this territory are urged to make greater use of this local market, which at present draws a large portion of its needs from the Union.

(b) Milk Recording.—The milk recording scheme established in 1929 has been well supported. There are now 32 herds on test, and though the service is expensive, its value in improving the standard of production in all herds where it is intelligently applied is hard to exaggerate.

(c) Creameries.—Considerable improvements in plant and organisation have been made in the number of creameries this year. Matabeleland is at present over-supplied with creameries, but there has been a serious lack of proper butter-making facilities in Mashonaland. The erection of a new creamery in Salisbury has now been decided on by the Rhodesian Farmers' Co-operative Industries, Limited, and should supply a long-felt want.

(d) Cream Supplies.—Little improvement is evident as far as the general quality of cream supplies is concerned. Large quantities of second and third grade cream, which become increasingly difficult to market each year, continue to be produced. Much of this low grade cream is produced by farmers situated long distances from the railway, who have gone into the dairy business, but who, in many cases, would be wiser in the long run to confine themselves to beef production.

(c) Cheese Factories and Cheese Making.—Progress is being made in cheese making. During the year three new factories were opened in Matabeleland and no trouble has been experienced in disposing of the manufactured product. A ready market for cheese exists in the north, and there appears to be some room for expansion of the cheese industry in this territory.

(f) Dairy Control Act.—The Union Dairy Control Act, No. 35 of 1930, came into force as from 1st October, 1930. The Act provides for a levy on butter and cheese manufactured in the Union, with the object of raising funds to finance the export of butter and cheese and to maintain the local price at a reasonable level. The Act makes provision for the participation of adjoining States, and at a meeting of creamery representatives held in Gwelo on the 14th October, 1930, it was decided as a preliminary step to adopt the principle of a voluntary levy on creamery butter until such time as the necessary legislation could be considered by the Parliament of this Colony. The effect of the Dairy Act should be to make all participating States or territories one economic whole as far as the dairy industry is concerned.

3. SHEEP AND WOOL.

(a) General.—Despite the depressed condition of the industry, a good deal of interest has been shown in sheep and wool. A small number of Merino sheep has been brought up from the Union by farmers in the north-eastern border area. Blackhead Persian sheep for breeding purposes have been in fair demand, and there has been some enquiry for mutton sheep of the British breeds. Mr. E. N. S. Warren, Acting Chief Sheep and Wool Officer in the Union Department of Agriculture, made a tour of investigation of the sheep raising districts in August and September of this year, and submitted a report which appeared in the January, 1931, issue of the *Rhodesia Agricultural Journal*. There are areas in this territory which are reasonably well suited for raising sheep, provided the sheep are farmed on the right lines, *e.g.*, the farms are paddocked, the grazing is rotated and the sheep are fed and dosed properly. Most of the failures in the past have been due to lack of knowledge or attention.

(b) Technical Officer.—The lack of a properly trained technical officer is severely felt at the present juncture. Mr. Kruger has carried out excellent work in the Melsetter-Chipinga area, but the time has now arrived for the appointment of a full-time officer.

(c) Breeding Stock.—There is a shortage of rams in this Colony. It is a difficult and expensive matter for individual farmers to import rams from the south. An arrangement for the co-operative purchase and the shipping of sheep from the Union would be very beneficial and could easily be arranged were a suitable officer appointed.

4. PIGS.

(a) General.—Although pig farmers have had a bad year, the price of maize has been low enough to allow efficient pig producers to carry on without serious loss. The present slump is largely a reaction to the super-normal prices during the period 1928 to 1929, and it is likely to pass off in the same way as similar depressions have done before.

(b) Bacon Factory.—A bacon factory has been opened in Bulawayo by the Rhodesia Export and Cold Storage Company to meet the needs of Matabeleland, and it is reported that the concern has been well supported and has experienced no difficulty in procuring a supply of pigs.

(c) Breeding Stock.—The demand for breeding stock, except for Large White pigs, has been slow. The general quality and management of pigs in this Colony still leaves much to be desired. Many farmers have yet to realise that pig farming is as specialised a business as the raising of any other form of live stock.

5. POULTRY.

(a) General.—For the first time in the history of Rhodesia, large scale exportation of eggs overseas has taken place. During the year approximately 2,000 cases, each containing 30 dozen eggs, were exported. The export of eggs to the northern territories by the Rhodesia Egg Circle continues to increase. It is noteworthy that during the ten months ended October, 1930, this Colony imported from the Union of South Africa one and a quarter million eggs, valued at £7,795.

(b) Stock.—The general management and conditions under which poultry farming is conducted have shown further improvement during the course of the year. Poultry farmers have had a fairly successful hatching season, and the stock reared this year has done well.

(c) Southern Rhodesia Egg Laying Test.—The eleventh annual egg laying test commenced on 1st March, 1930, and terminated on 30th January, 1931. The test was very successful, and the condition of the birds was excellent.

(d) Poultry Experiment Station.—Preliminary work has been started at this station, chiefly with the object of cheapening the cost of feeding without lowering the efficiency of the ration. The results will be published in the *Rhodesia Agricultural Journal* from time to time.

(e) Extension Services.—The number of visits paid to farmers by the officers of the Poultry Division during the year was 751. The number of personal interviews at the office of the Poultry Division was 723, and *post-mortem* examinations 196. The outstanding service given to farmers has been in connection with the systematic culling and elimination of non-profitable birds, practical work in the selection and mating of stock, and problems connected with the incubation rearing of chicks.

6. STAFF.

Mr. W. Fleming's period of active service in this Department terminated in March, 1930, and in April I took over the newly-created post of Senior Officer in Animal Husbandry. In December, 1930, a further re-organisation took place in the Department, and the Divisions of Dairying and Poultry were brought under the control of the Senior Animal Husbandry Officer. At this stage it is too early to report on the effects of the re-organisation.

A. E. ROMYN,
Senior Animal Husbandry Officer.

Report of the Division of Plant Industry for the Year 1930.

Season and Crops.—The season proved a disappointing one to many farmers. The planting period was generally favourable, but early in January a severe visitation of army worm made its appearance in several areas, and considerable damage was done to individual crops by this pest. Maize, attacked while still below 12 to 18 inches in height, seldom recovered sufficiently to produce grain, while that infested at still earlier stages of growth was destroyed entirely. Following on this setback prolonged periods of drought were experienced, extending in some districts over the latter part of January, throughout February and into early March. On a number of farms no rain of a penetrating nature fell for periods of from 30 to 39 days, and this scarcity of moisture occurred—in the case of maize—at the most critical period of crop growth.

Maize.—Taking the adverse factors into consideration, the total production of maize—stated by the Government Statistician to be 1,926,919 bags from 318,501 acres, or a mean yield of practically 6.0 bags an acre—may be regarded as satisfactory, and affords evidence of the better cultural methods gradually being adopted. A noticeable feature of the season was the manner in which the crop on well-farmed, fertile land resisted unfavourable conditions, while suffering intensely on soils impoverished of fertility and organic matter. The collapse of the maize market throughout the world has placed maize growers of the Colony in a most precarious position. While it is impossible to give the precise average cost of production, it is yet certain that if all costs are taken into account the crop can seldom under existing conditions be produced at much less than 7s. a bag. In the case of many growers the figure is nearer 10s. a bag, and with an average selling price from the main areas of production of about 7s. per bag, it is evident that a large proportion of the crop has been marketed at a loss. The serious state of affairs confronting the industry has, it is believed, done more to bring home to farmers the urgent necessity for more economical production than any other factor of recent years. Better farming has been more general during the past two seasons, and in particular the acreage devoted to green manure crops has shown a most satisfactory increase. But the greater yield per acre and the reduced costs in several directions resulting from an extensive green manuring programme have not yet had time to make themselves apparent, and thus only a few farmers are so far materially benefiting from these reactions. The cost of native labour is unquestionably the greatest item in the total cost of production, and if maize-growing is to be placed on a satisfactory basis there must be a greater economy in labour, accompanied by an increased return of grain per acre. The two ideas are not incompatible.

Wheat.—Considerable improvement has recently taken place in the methods employed by wheat growers, and production is in consequence likely to show an increase during the next few years. Artificial fertilisers are being used more freely for this crop, and the benefits of green manuring in preparation for wheat are being widely recognised. It is to be regretted that the very severe and exceptional frosts experienced in September over most of the wheat-growing areas were responsible for a considerably reduced return on many farms.

Green Manuring.—The Government Statistician has recently compiled extremely informative figures bearing on this practice, and his findings are confirmed by a number of leading farmers, who have now green manured portions of their lands for several years in succession. The whole matter was discussed in a lengthy article published in the November issue of the *Rhodesia Agricultural Journal*, but the subject is of such great importance that a brief recapitulation of a few of the points will be permissible:—

"In 1927-28 there was an increase of 473 acres or 5.8 per cent. in the area placed under green manure crops, whereas in 1929-30, compared with 1927-28, there was an increase of 7,420 acres, or 86.6 per cent.

"The percentage maize yield of those farmers who have regularly green manured for four years in succession is 50 per cent. higher than the average obtained over the Colony as a whole. More striking still is the fact that in an unfavourable season the average yield of these men is not so adversely affected as is that of those who have not green manured at all, and in the low production season of 1927-28 their yield was 62 per cent. instead of the usual 50 per cent. higher than that for the Colony in general.

"Where green manuring has been practised, but not consistently, the average yield is increasing, and is 30 per cent. higher than for the Colony as a whole."

It is usually estimated that where practically the whole farm is under maize about 10 native labourers are employed for every 100 acres under this crop. Assuming 16s. 8d. per month to be the average cost of each labourer's wages and food, and assuming the whole strength of the labour force to be maintained for the 12 months of the year, as is often the practice, the native labour cost per 100 acres will be £100, or £1 per acre. The farmer who regularly green manures one-fourth of his arable land each year should be able to reduce his native labour force by nearly, if not quite, 25 per cent., and simultaneously should increase his average grain yield by fully 50 per cent., which will more than compensate for the smaller acreage under the crop.

A reduction of £25 per 100 acres in labour costs alone spells a saving of 5s. per acre, or on a 10-bag-an-acre crop 6d. per bag. The reduced acreage under maize should enable the farm to be better worked with fewer draught animals and implements, and by reason of the better mechanical condition of the land due to green manuring there should be less wear and tear of implements. The economies which can be effected by a systematic and extensive green manuring programme are thus very considerable, and herein may be found an outstanding means of lowering costs of production.

Mixed Farming.—In spite of the constantly repeated advice in favour of more general adoption of mixed farming, the average maize grower has still a long way to go before his position in this respect can be regarded as satisfactory. All farmers, except those engaged in very special enterprises, should combine some form of animal husbandry with their arable operations, and the most suitable line which this can take in the case of maize farmers would perhaps generally be the maintenance of a herd of cattle of pronounced beef type in order that suitable steers may come forward each year for fattening. The feeding of bullocks provides an outlet for a portion of the grain produced, and enables rotation crops, particularly legumes, to be utilised economically. On most maize farms to-day the breeding cattle are of nondescript character—pre-eminently suitable for neither beef, milk nor trek purposes.

Witch Weed.—This parasite is presenting a serious menace to the maize industry and it is essential that effective steps should immediately be taken for its control.

During the year the series of field experiments under the direction of Mr. Timson, Assistant Agriculturist, and designed to test various methods of control, were continued in the Mazoe Valley. The first experiment on Craigengower farm was concluded with satisfactory results. A trap crop of maize, broadcasted at the rate of 50 lbs. per acre, had been ploughed under in January, 1928; a crop of ground nuts was planted immediately after, and yielded a return of 12 bags per acre. In December, 1929-30, a commercial crop of maize was planted on this land and Mr. McCall states that the amount of witch weed appearing above ground was very considerably less than that present prior to the trap cropping. Certainly, careful inspection of the plot during 1930 revealed very little witch weed.

As far as observations go at present, Sudan grass appears the most satisfactory trap crop, the only objection to it being the high cost of seed. This could perhaps be obviated by farmers in the dryer areas of the Colony

growing the crop for seed or by collective buying in large quantities from the Union of South Africa.

Sisal Hemp.—Good growth of sisal hemp has been observed on the farm of Mr. P. G. Hunt in the Que Que area, and almost equally good development of the plants is to be seen on certain farms in the neighbourhood of Shamva and Gatooma. If the small portable decorticators prove to be the success that is claimed for them, there would seem to be possibilities for this crop in the areas mentioned, when world demand justifies an extension of sisal planting.

Oats.—Work on the improvement of varieties of oats found suitable here as rainy season crops has now reached a measure of fruition. By careful selection and segregation of pure line strains, types which are very much in advance of any summer oat previously grown in this Colony have been produced, and this is particularly true of certain hull-less strains. Full particulars of this investigation were recently published in the *Rhodesia Agricultural Journal.*

Clovers.—The introduction and trial of various kinds of clovers has been continued, and from experiments already carried out on several sand vlei areas, it is safe to predict that with proper management and fertilisation, it will be possible to establish and maintain several of the clovers as an integral part of the grazing on this particular type of land. There are many thousands of acres of wet sand vlei in Rhodesia, and the combination of clovers with the natural grasses or with exotic grasses which may be introduced on such land, cannot fail to be of immense benefit to pastoral interests.

Horticulture.—A small increase in the exports of citrus fruit is to be recorded. Final figures are not yet available, but the total quantity railed for export was about 193,000 cases. Several thousand cases, however, were rejected at Union ports and the final total may thus fall to about 185,000 cases actually shipped. Of this amount 29,174 cases were exported via Beira. The previous season's figures were 130,000 cases shipped via Union ports and 38,663 cases by Beira—a total of 169,571 cases.

New Markets.—Seventy-seven consignments, comprising 10,937 cases, were forwarded to new markets and better average prices were obtained than for fruit exported to Great Britain.

The new markets exploited comprise:—

Canada	7,535 cases	Italy	160 cases
France	700 ,,	Singapore	100 ,,
Germany	569 ,,	Calcutta	75 ,,
Egypt	579 ,,	Madras	25 ,,
Sudan	470 ,,	Colombo	25 ,,

The chief feature of these exports has been the excellent results obtained on Canadian markets, where the prices realised have exceeded London prices by as much as 10s. per case. Export through Beira has continued to prove satisfactory and shippers propose to make increasing use of this route. No provision, however, at present exists for the inspection of fruit at that port, but it is hoped, with the co-operation of the Government of the Mocambique Territory, to arrange for a temporary inspector there during the fruit export season.

Citrus By-products.—The prospects of the Colony for this industry were investigated during the year by a gentleman with wide experience in Italy of the production of essential oils and citric acid. A favourable impression was formed, and it is understood that expression of orange oil will be commenced in the Mazoe Valley as soon as the coming crop is sufficiently advanced.

Deciduous Fruits.—The Government Horticulturist reports as follows:—

"Steady progress is being maintained in the establishment of deciduous orchards. Plantings on the Rhodes Inyanga Estate have been

extended to nearly 3,000 trees, and in lesser quantities, varying from 100 to 500 trees, on a number of farms in the Umtali, Makoni, Mazoe (Umvukwes) and Salisbury districts.

"It is also gratifying to record that deciduous growers are improving their grading and marketing methods and this improvement is likely to be maintained and extended as the growers realise the monetary advantage of grading and packing in a proper manner.

"Selections of the best varieties of deciduous fruits are being collected and tested out.

"Pecan nut seedlings have been distributed amongst progressive farmers in districts where the trees are likely to thrive, and the same applies to the surviving Avocado pears received from the United States of America in 1928.

"Observation is being kept of fifty mango trees near Umtali, to ascertain which varieties or types are most suited for propagation purposes."

Tea and Coffee.—It has not been possible to do any further work along these lines other than to distribute coffee seed introduced on the recommendation of Mr. Trench. Bourbon and Jackson's Hybrid seed was issued to certain growers and the remainder of the seed was sent to the Stapleford Forest Reserve to be raised in seed beds for later distribution.

Marketing of Fruit and Perishable Produce.—A considerable amount of time has been devoted by the Horticulturist to an endeavour to arrange a co-operative marketing scheme for fruit, vegetables and flowers, and it is hoped that at least one co-operative supply store for these products will be opened early in 1931.

Tobacco.—For the last three months of the year, the Chief Tobacco Adviser, Mr. D. D. Brown, was absent in England at the invitation of the Empire Marketing Board, and was engaged in a critical study of conditions affecting the sale of Rhodesian tobacco in Great Britain and elsewhere overseas.

Information is being obtained on all points calculated to promote the marketing of this product, and simultaneously technical investigations are being made with a view to preparing the ground for organised research to be conducted on the Tobacco Research Station, Marandellas.

Enquiry has been made into processes claimed to improve the aroma, flavour and burning qualities of tobacco, and experiments are in progress to compare the carbohydrate content of Rhodesian and American tobaccos; at a later date, and if results justify it, the investigation may be extended to the gum and essential oil content of the two types of leaf.

In a report already received, Mr. Brown urgently stresses the importance of limited production until present surpluses are removed from the market. He emphasises the need to maintain a high standard of quality in tobacco intended for export to Great Britain and sounds a warning note against any rapid extension in the production of dark fire-cured leaf.

The following are extracts from the report of the Acting Chief Tobacco Adviser, Mr. Ellis:—

"Production.—The production of Rhodesian Virginia and Turkish tobacco during the last five years has been as follows:—

	Virginia.			Turkish.		
Season.	Acreage.	Yield in lbs.	Acre yield.	Acreage.	Yield in lbs.	Acre yield.
1929-30	11,000	5,400,000		764	322,000	
1928-29	16,800	6,700,000	398	979	329,000	336
1927-28	45,711	24,491,000	536	911	452,000	496
1926-27	29,172	18,631,000	638	992	633,000	638
1925-26	13,160	5,313,000	404	755	367,000	459

"The figures for 1929-30 are estimated since final returns are not yet available.

"A noticeable feature of the past season has been the tendency to concentrate on the production of quality tobacco as opposed to high production

per acre. Attention has been given to the growing of heavier varieties such as White Stem Orinoco, Gold Leaf and Warne, while the lighter varieties, such as Hickory Pryor, have been topped lower than in previous years and greater attention has been paid to suckering. In consequence the crop had more body but less colour and was more suitable for the requirements of overseas manufacturers than the majority of previous crops. Particularly was this the case with certain fire-cured leaf grown round Shamva, where some producers obtained as much as 98 per cent. wrapper tobacco, the quality of which was as good as that produced anywhere in the world.

"Improved Field Methods.—It is also satisfactory to record that growers are tending to pay greater attention to field operations, with consequent heavier yields and lower cost of production per acre. But from observations made, it appears that in general the number of acres which one barn is expected to account for is still on the high side, and that it would be preferable to assume that one barn is capable of dealing with seven instead of ten acres. Adoption of this assumption would obviate the later plantings which as a rule give very inferior tobacco.

"Costs of production too, in many instances, could be still further reduced by better organisation of labour, particularly during the harvesting and tying of the crop. The number of 'boys' used for this operation is still on the high side, though considerably less than two years ago.

"From figures furnished by the suppliers of fertiliser, it is expected that plantings will amount roughly to 11,000 acres of flue-cured and 1,750 acres of fire-cured tobacco. Yields from this area may be expected to approximate six million pounds of the former, and one and a half million pounds of fire-cured leaf.

"Tobacco Research.—Work has been commenced on the Tobacco Research Station on Research Farm, Marandellas. The station is under the charge of the Tobacco Research Officer, Mr. W. Collingwood Evans, and a fairly complete series of fertiliser experiments has been laid down, chiefly with a view to determine what constitute the best sources of nitrogen and potash to give maximum quality and yield per acre. A commencement has also been made with other field experiments, but the main programme of research to be undertaken awaits the return of Mr. Brown from overseas."

Botany.—The activities of the Department in respect to botanical work which have for so long received inadequate attention, were placed on a satisfactory footing by the appointment of a Botanist in February, and of a Senior Botanist in November. Miss Sydney M. Stent, late Agrostologist in the Division of Botany of the Union, has been appointed to the latter post, and already important additions—which are being added to daily—have been made to the herbarium.

Herbarium.—When the Senior Botanist assumed duty, the herbarium consisted of some 1,500 sheets of plants included in 512 genera. To date, 1,900 specimens, 194 genera, have been added, making a total of 3,400 specimens and 706 genera. About 500 of these specimens were received from the National Herbarium, Pretoria, and for these and for much assistance in other directions we are greatly indebted to the Division of Plant Industry of the Union Department of Agriculture. Most of the specimens have been mounted and labelled, but a large number have been filed on the rough duplicate sheets in order to have them available for reference—these are being mounted gradually, and from now on no unmounted specimen is being filed in the herbarium. Large parcels of plants are lying awaiting identification and on these progress is being made as time permits. The systematic index to the herbarium, the economic index and the literature index have not yet been commenced.

Plant Pathology.—It is regretted that no report can be submitted for this branch of the Division, since the Plant Pathologist suffered a serious breakdown in health towards the end of the year and has since been absent from duty on recuperative leave.

Gwebi Demonstration Farm.—Operations at this centre have continued on the lines set forth in previous reports. The season proved a fairly successful one, as an indication of which it may be mentioned that 467.4 measured acres of maize produced 4,936 bags or an average of 10.6 bags an acre as compared with 9.05 bags an acre for the previous year. Apart from maize, 245 acres were under various rotation crops principally grown for stock feed and 72 acres were under green manure crops consisting of Sunn hemp, sunflower, dolichos beans and a mixture of Sunn hemp and sunflower. The total area under crops was 784.9 acres.

Check-row Planting of Maize.—A check-row maize planter, obtained on trial from a local firm, was received somewhat late in the season and could not, therefore, be used as extensively as was intended, but very satisfactory check plantings were effected, and it would seem that the more general use of this type of planter with a view to reducing hand hoeing can be recommended. The regular dropping of the grain left nothing to be desired and no difficulties were experienced when native labourers and draught animals became used to the machine, though well trained, steady planter oxen are necessary.

Mole Draining.—A mole-draining plough was purchased in 1928 and preliminary draining trials on a small scale were conducted with the implement that year. During 1930 further drains were put down on a ten acre section of heavy clay land which had been abandoned for crops owing to its extreme wetness. Both second and first year drains are running strongly at the time of writing, and the Farm Manager reports that this land, which before draining was usually a morass after the latter part of December—incapable of being worked—can now be cultivated with oxen, 24 to 36 hours after heavy rain has ceased. The mole drains were put down under the direction of the Division of Engineering and are 200 yards in length and 10 yards apart. Oxen were used for drawing the plough, but the draught proves too heavy even for 24 bullocks, and for continuous and satisfactory working tractor power is necessary. These preliminary trials justify the belief that mole draining with tractor power will prove a potent factor in rendering large areas of heavy wet land in the Colony more productive, both in respect of crops and pasture, than in the past.

Stalk-borer in Maize.—The control of this pest on the Gwebi has in the past been effected by removing the upper part of the young plants visibly affected by the worms. This year the chemical preparation known as "Derrisol," diluted to a strength of 1-1,000 parts of water, has been used. The treatment appears to be highly successful and one native has been found able to treat about 7 to 8 acres a day of lightly infected crop, using knapsack retainers holding about two gallons of the mixture.

The following extracts are from the Farm Manager's annual report:—

"Two potash trials were made, chiefly with a view to testing whether maize on land treated with potash salts dried out more quickly than that on land which had not received potash. There was found to be no noticeable difference, in fact, if anything, the grain of the maize which had received potash dried off more slowly than that on the non-potash plots.

"Crop Rotations.—Results during the last five years lead to the conclusion that the arable land had nearly reached its peak of crop production under existing methods of fertilising, manuring, etc. With a view, therefore, to keeping the yields on an upward trend and to ascertain to what extent maize will economically respond to higher farming and heavier applications of fertilisers, the rotations in practice have been redesigned and will in future provide for more generous treatment of the land. These new systems commence this season.

"Live Stock.—The Friesland herd numbered 122 head at the beginning of the year and calvings totalled 46, of which 21 were females. Seven young pedigree bulls and one heifer, seven grade breeding cows and two old cows and 18 grade bull calves were sold and realised a gross sum of £410 14s.

Milk production amounted to 28,141 gallons, of which the pedigree herd produced 10,293 gallons and the grade herd 17,848 gallons or an average of 28.6 and 25.5 lbs. per cow per diem respectively.—Cream produced amounted to 11,471 lbs., of which 9,671 lbs. were disposed of to the Creamery.

"Pedigree Shorthorns.—This small herd has continued to do well and has increased by three bull calves. In spite of being inoculated neither against redwater nor gall-sickness, the animals have maintained good health, the only serious trouble experienced being from ophthalmia.

"Forty grade Shorthorn heifers were purchased with a view to breeding some of the farm's requirements of store bullocks.

"Fattening Bullocks.—Forty-five animals were on hand in this section at the beginning of the year and transfers received from other sections numbered 6. Purchases numbered 92 and sales for the corresponding period were 82, realising a gross cash return of £1,228 6s. 10d. and leaving on hand at the end of the year 61 animals.

"Of the sales, 25 head were exported overseas and realised £718 4s. 8d. or an average gross price of £28 14s. 7d. per head. Of the remainder sold, 10 were sent to Johannesburg and realised £111 17s. 6d. or an average price of £11 3s. 9d. per head. The balance were sold on local markets.

"Pigs.—Twenty-one pigs were on hand at the beginning of the year. Births numbered 100 and purchases of weaners, etc., 122. Deaths were 13 and sales 111, leaving a total of 119 on hand at the end of the year.

"Purchases during the year included 4 boars and 6 sows of the Large White and Large Black breeds, imported from the United Kingdom."

Agricultural Experiment Station, Salisbury.—A report dealing with the principal results obtained at this station is published annually in the *Rhodesia Agricultural Journal.*

Selections of Sunn hemp made with the object of obtaining strains which will produce seed more freely gave encouraging results.

Experiments with raw rock phosphate and (19 per cent.) superphosphate have supported those of previous years by indicating that weight for weight the rock phosphate is as effective as the superphosphate, though somewhat slower in action.

Fertilisers applied to the ground nut crop on moderately heavy red land seem singularly ineffective. Small increases from phosphatic fertilisers have been recorded, but the value of the increase is usually less than the cost of the fertiliser.

Various methods of applying fertiliser to the maize crop have been the subject of investigations during the past two seasons and promise to yield results of economic importance.

Mr. Arnold, manager of the station, has recently given considerable attention to selective breeding with oats, with the result that improved strains which are reliable when grown as summer crops are now available. One of these produces hull-less grain of high feeding value which it is believed will prove especially valuable to poultry keepers and dairy farmers. A special report on this subject will shortly be published in the *Rhodesia Agricultural Journal.*

Work on similar lines has produced superior strains of white-seeded and black-seeded sunflowers and seed of these also is available for distribution to farmers in small quantities.

The area under pasture grasses has been extended with a view to investigating the stock-carrying ability of some of the more promising species. Legumes suitable for depasturing, and in particular clovers, are receiving increased attention.

The systems of crop rotation under investigation continue to provide much useful information, and afford striking evidence of the value of systematic cropping, coupled with the judicious use of artificial fertilisers.

Sand Veld Research Farm, Marandellas.—After careful examination of a large number of sand veld farms, it was finally decided that all the conditions required were best met by a certain section of the Lendy Estate at Marandellas. Three thousand two hundred and twenty acres of this land were purchased, and actual development operations were commenced in February. The farm has been divided into four sections, namely (1) the Tobacco Research Station, (2) the Sand Veld Experiment Station (dealing with all crops other than tobacco), (3) the Pasture Research Station (under direction of the Chief Chemist) and (4) the Commercially Farmed Section.

Five hundred thousand bricks were made, and delivered by contract to the various building sites to relieve the pressure of ox labour for more direct farming activities.

The grazing on the farm is not of the best, being largely confined to wet vlei land which after early December provides only sour and unpalatable feed. But this natural pasturage can greatly be improved by close paddocking, by rotational grazing and mowing, by suitable fertiliser treatment and by the introduction of clovers. It is felt that the development and management of the vlei pastures on this farm will offer an interesting and fruitful line of enquiry.

The Experimental Section, which at present is 100 acres in extent, has been developed very rapidly in the limited time available, and this season there will be 50 acres under experimental plots. It is intended that this should become the principal sand veld experiment station of the Colony.

Tobacco Experiment Station.—Owing to a reduction in the Vote, fewer apprentices than usual could be enrolled at this station. Useful work has, however, continued to be preformed both in the direction of agricultural education and in that of crop experiments.

Reference was made in my last report to an outbreak of eelworm, or nematode, in the tobacco fields. It is of interest to record that by thorough desiccation of the soil during the winter months by means of several ploughings and ridgings, the pest was largely controlled, and good tobacco was subsequently grown on the affected land.

The general crop work was again expanded by additional acreages brought in for summer experiments, and further vlei land brought under the plough for winter crops. The total area under cultivation was 135 acres.

Tobacco.—Three hundred and fifty-eight experimental plots were under tobacco, the principal work comprising "topping" and priming trials carried on in co-operation with the Chief Tobacco Adviser, "white mould" experiments under the direction of the Plant Pathologist, and nematode investigations under the supervision of the Chief Entomologist, together with variety trials and rotation and fertiliser experiments. Field trials were also carried out with the J. I. Case mechanical tobacco transplanter.

Excellent yields from tobacco following green manure crops were obtained, an average of over 1,000 lbs. of leaf being reaped per acre.

Some 10,000 lbs. of graded leaf was marketed, of which 9,039 lbs. was purchased by the Imperial Tobacco Company at prices ranging from 4½d. to 1s. 6d. per lb.; revenue from this source amounted to £360 3s. 9d.

A further 7,000 lbs. of tobacco from the previous year's crop (1928-29) was graded, baled and despatched to the Tobacco Pool for disposal.

Apprentices.—An average of fourteen apprentices has been maintained, and appreciation of the value of the instruction afforded is widely expressed by parents and guardians. In most cases, too, good reports are received from subsequent employers of apprentices after they leave the station.

In August a fourth group of apprentices completed their two years' course of training, making a total of 31 young Rhodesians who have taken their certificates since the inception of the scheme. All apprentices who left the station this year on completion of the course took up positions on farms.

The system of plot work continues to provide an excellent medium for training, and it is apparent that many apprentices who are unable readily to absorb theoretical instruction can yet learn and retain their knowledge by doing all the practical work on their respective plots with their own hands.

Bulawayo and Gwelo Demonstration Stations.—These two stations continue to supply useful information to the officers of the Division, and through them to the farmers of the districts in which the stations are situated. Farmers in the vicinity of Gwelo have shown considerable interest in the work carried on at that centre, but the same cannot be said of Matabeleland farmers in respect to the Bulawayo Station, and in view of the experimental work which will be conducted as a part of the operations of the Matopo School of Agriculture, there would seem no reason why the Bulawayo Station should not be closed down at the end of this season and the money thus saved be put to more advantageous use.

Enkeldoorn Demonstration Station.—This station is worked co-operatively by the Department in conjunction with Mr. P. O. Brocklehurst, of Belvoir Spinney, on whose estate it is situated. It has now completed two seasons, and during November was planted for the third year. The best maize yield recorded in 1929-30 was 10.5 bags an acre and the lowest yield was 6.75 bags an acre. All other crops gave equally good returns and the year's work may be regarded as highly successful.

The winter cereal experiments on this farm have been discontinued and transferred to the farm Uitkijk, owned by Mr. C. W. Lamprecht, where the soil—veld land—is more typical of the average winter cereal lands of the Charfer district. Four acres are under experimental treatment on this farm. The green manure crops in preparation for wheat to be seeded next April were sown in October.

Maize Grading and Export.—The first applications for grading were received on the 30th June; these applied to small consignments on the Mazoe line for railing to Northern Rhodesia, but it was the middle of August before any appreciable quantity of maize was offered for grading.

On the whole the grain was not of as good quality and the bags contained more chaff and foreign matter than usual, with the result that the percentage of third grade and rejects was higher than in the previous year.

Wet Maize.—Even more trouble was experienced with moist maize than in past seasons. Although comparatively few consignments of over 14 per cent. of moisture were encountered, yet maize under this figure, but above the maximum of 12.5 per cent., was found to be unusually slow in drying.

As is inevitable when large amounts of moist maize are offered for inspection, a considerable number of complaints in regard to grading were received. Much of the time of the graders was wasted in being moved from point to point to locate dry maize, and further loss of time resulted from the re-inspection of maize which had been rejected on account of excess of moisture at the first examination. In order to endeavour to assist farmers and exporters, some consignments were examined and tested five and six and even more times before they could be passed.

The sending of wet maize to the railway lines for grading involves all concerned in serious loss. The grading staff is delayed in its operations and a larger number of graders is required to carry out the work in the limited export season than would otherwise be needed. Farmers are disappointed in effecting quick sales, and their native labour is employed unprofitably in re-stacking and in ineffectual journeys to the railway to load, while exporters suffer loss through being unable to take up contracts offering, or through delays after trucks or freight space have been reserved.

The farmer himself must take practical steps to overcome this recurring difficulty of wet maize, otherwise severe penalties must be imposed on those who continue to remain delinquents in this respect.

It is much to the credit of the Senior Grain Inspector and his staff that in spite of the many difficulties encountered, not one bag of maize was held up at Beira owing either to excess of moisture or to presence of weevil.

Grading Regulations.—Two changes in the regulations took place during the season. The amended regulations governing the export of maize and maize meal through the port of Beira were brought into force on the 1st March, 1930, and new Rhodesian regulations relating to the export of hominy chop and maize feed were introduced and published in the *Government Gazette* during May.

Grading and Export Statistics.—A total of 789,977 bags of maize and 80,261 of meal was graded between the 1st January and the 31st December. Ninety-seven per cent. of the maize was passed as No. 2 grade and 1.3 per cent. as No. 3 grade, while 1.2 per cent. was rejected. The bulk of the maize was graded in Mashonaland, only 4,854 bags being dealt with in Bulawayo, where, however, 70,982 bags of maize meal were graded as against only 9,279 in Salisbury.

The totals for the previous year—1st January to 31st December—were maize 821,000 bags, meal 27,139 bags.

It is of interest to note that whereas between the months of June and October in 1928 no maize was railed from Southern Rhodesia to Northern Rhodesia and the Congo, and only 7,463 bags in 1929, yet during the same period of the past season some 75,000 bags were despatched to these adjacent territories. Railings of meal to Bechuanaland over the same months, decreased from about 11,000 bags in 1929 to under 1,500 bags in 1930.

In spite of the many delays due to the presence of so much wet maize, 599,543 bags were railed this season to Beira between the 1st June and 31st October as against 616,497 bags during the similar period of 1929. The result reflects credit on the Railway Administration and on the grading staff.

In conclusion it is desired to record with appreciation the loyal service in the interests of the Colony of all members of the staff, and also to return thanks to other Divisions and branches of the Department for the help readily given by them in matters calling for their co-operation.

H. G. MUNDY,
Chief Agriculturist and Chief of the
Division of Plant Industry.

Report of the Cotton Specialist, Empire Cotton Growing Corporation, for the Year 1930.

Season.—The season opened moderately well for cotton in that the rainfall was ample for planting, but it would have been an advantage had it been earlier in many cases.

Conditions in January were on the dry side, although the crop did not show visible signs of distress. The effect, however, was to delay flowering, thus making the crop more liable to American bollworm attack later in the season. This delay was reflected during the boll-opening period, in late May and early June.

Acreage.—It was estimated that sufficient seed had been issued to plant 10,000 acres had growers used a seed rate of 10 lbs. per acre as recommended. The actual area planted, however, appears to have been in the vicinity of 7,000 acres.

Production.—The amount of seed cotton produced according to returns from ginneries was 1,777,238 lbs., or an average of 289 lbs. per acre. This does not appear to be very satisfactory at first sight, but compared with previous years, except 1923-24, it shows a big stride forward.

Average Yields per Acre Obtained from 1923-24 to 1929-30.—

Season.	Acreage planted.	Average yield per acre of seed cotton.
1923-24	3,947	428
1924-25	62,858	93
1925-26	66,086	124
1926-27	8,134	90
1927-28	1,340	85
1927-28 (U.4 cotton seed increased from 15 lbs. to 2,000 lbs. on Cotton Breeding Station.)		
1928-29 (Above ton of seed increased by farmers to 66 tons.)		
1929-30	6,134	289

The above table illustrates the increase that has been made in the average yield per acre obtained during the last six years. The writer had hoped for an average yield of 300 lbs. per acre, but the crop did not quite come up to expectations, chiefly for the following reasons:—

(1) American bollworm attack appeared to be very severe, and may have accounted for as much as 50 per cent. of the crop, and possibly more.

(2) The crop having been delayed by the drought in January made it even more susceptible to the bollworm attack.

(3) The seed rate employed was much too low owing to the necessity of rationing the seed in order to meet the demand. This resulted in poor stands being obtained, generally, throughout the country.

(4) Miscellaneous causes, such as late planting, insufficient cultivation, and in some cases neglect, further tended to reduce the average yield per acre.

In future years there will be no necessity to economise seed for planting, as the supply now available is more than sufficient to meet the demand, and the necessity of using a heavy seed rate for planting has been stressed whenever possible.

As a result of a number of experiments carried out in the districts in conjunction with the Cotton Breeding Station, Gatooma, there appears to be strong evidence to show that a closer spacing than has hitherto been used is desirable.

There also appears to be sufficient evidence to indicate that little, if any, benefit is derived by applying fertiliser direct to cotton.

Recommendations to the above effect have been made to farmers, and in the use of fertilisers they have been recommended, meanwhile, to apply them to their other crops, which precede cotton in their rotation.

It has to be recognised that sufficient information is not available to permit of sweeping generalisations or very definite recommendations to be made. At the same time it is felt that the advice given in respect to the use of a heavier seed rate and closer spacing will in itself lead to better crops, while in the matter of the very guarded advice given respecting the non-application of fertilisers, it is considered that farmers should show a considerable saving in their cotton production costs.

Quality.—Southern Rhodesian cotton has earned the reputation of being bright, clean and of good colour and staple, but it shows decided softness and lack of character. These are technical terms employed in the trade, the exact meaning of which is not easily conveyed to the public. The lack of character is perhaps better interpreted as "weakness." This weakness has always been recognised and it was hoped that in U.4 cotton it would be largely, if not wholly, overcome.

The season, however, was not favourable to the production of "strong" cotton, and in this respect the crop was somewhat disappointing. It may safely be stated, however, that if a jassid-susceptible type of cotton had been grown, the quality would have been very much worse.

The "softness" of the crop under review led to a certain amount of misunderstanding among a number of cotton growers, who got an impression that jassid resistance had been bred at the expense of quality. On close investigation, however, it was found that such is not the case. In fact the reverse may be said to have taken place, and the re-selections from U.4 have, so far, shown a distinct advance in the right direction, both in regard to quality and yield.

These re-selected strains have been issued to growers in 10 lb. packets for the purpose of bulking up seed in special plots, and it is satisfactory to record this scheme of seed improvement has met with the general approval of cotton growers throughout the Colony.

It is not suggested that improvement in the "character" of Southern Rhodesian cotton will take place suddenly, but steady progress is being made towards obtaining this desirable character. In the event of a favourable growing season, however, we may find a sudden improvement which, should it occur, must not be taken to mean that the difficulty under discussion has been finally overcome.

Ginning.—In all, three ginneries were in operation: one at Salisbury, and the Co-operative Ginneries at Bindura and Gatooma. The latter are affiliated to the Central Co-operative Cotton Exchange, Limited, Durban, which organisation, it is satisfactory to record, gave prompt and efficient service, and sold all cotton entrusted to them for sale.

Visit of Mr. T. C. Hesse, manager, Central Co-operative Cotton Exchange, Limited, Durban.—Mr. Hesse toured the cotton growing areas of Southern Rhodesia during part of January and February, and addressed well attended meetings of cotton growers in Gatooma, Bindura, and Sinoia. His visit was much appreciated and he is due to tour the country again during the current season.

Appointment of Seed Cotton Classifier.—Mr. J. Z. Boshoff was appointed Seed Cotton Classifier as from 18th April, 1930. The effect of his appointment was soon noticeable in an improvement in methods of sampling which has given much satisfaction, and is said to have facilitated sales.

His time has been fully occupied in classifying and matching seed cotton at the Co-operative Ginneries prior to ginning, and subsequently in conducting an investigation into the germinating capacity of cotton seed.

The Cotton Breeding Station, Gatooma.—The outstanding feature of the season was the very severe attack of American bollworm which reduced

the yields. This is the second season in succession that the station cotton has suffered. On the one hand these severe outbreaks of bollworm are a misfortune in that they do not give the plant breeders an opportunity of demonstrating what their re-selections are capable of producing under good conditions. They also interfere with the strict comparisons of the strains under trial. On the other hand, if bollworm is to become a menace, which it now threatens to be, it is better that the cotton breeding station should suffer as much, if not more, than private growers. One effect of the bollworm attack during the season under review was to clearly demonstrate how payable yields can be obtained by the combination of planting more prolific strains and adopting the practice of closer spacing in the row.

The annual report, which has to be rendered to the Empire Cotton Growing Corporation for inclusion in their "Reports from Experiment Stations," was despatched on the 18th of November.

Progress has been made in the erection of a plant breeder's bungalow, and the construction of an implement shed with attached office and store is now near completion. Properly equipped laboratory and seed store accommodation is urgently required, as the existing mud-brick buildings have survived their period of usefulness, and now constitute a menace, as they have reached a condition which can only be described as "dangerous." It is unlikely that they will last out the current season, and their ultimate collapse appears imminent.

Visit of the Vice-chairman, and Director of the Empire Cotton Growing Corporation.—Mr. Arthur Foster, vice-chairman, and Sir James Currie, K.B.E., C.M.G., director, visited Southern Rhodesia during part of May and June, 1930. They inspected the Cotton Breeding Station at Gatooma and visited farmers in the Hartley, Lomagundi and Mazoe areas. At Bulawayo and again in Salisbury they were enabled to meet members of the Government, senior officers and prominent members of the agricultural, mining and commercial community.

They expressed satisfaction at the progress of the cotton growing industry since the previous visit of the director, Sir James Currie, three years previously. They further expressed confidence in the future of cotton as a suitable crop for Southern Rhodesia in rotation with other crops.

Visit of Dr. S. C. Harland.—Dr. S. C. Harland, who holds the appointment of geneticist to the Empire Cotton Growing Corporation on their Cotton Research Station, Trinidad, toured the Colony in May, 1930, and has incorporated his impressions in a special report submitted to the Empire Cotton Growing Corporation.

Prospects for the Current Season.—It is too early, as yet, to state what acreage has been planted to cotton this year, but conversations with prominent farmers seem to indicate that a considerable increase has been made. If such is the case, then it appears very significant that increased acreages should be planted on a declining market. This may be discounted to a certain extent by the depressed conditions of the market for maize, but not as much as might appear at first sight. Had the price of cotton maintained the previous year's level, there might be more justification for such an argument. The actual position, however, is that last season's crop was sold at prices ranging from thirty to fifty per cent. less than that of the previous season. It seems only fair to conclude that the attitude of growers, by increasing their acreage, demonstrates an increased confidence in cotton. If their confidence is justified, and there is considerable evidence to show that it is, there appears every reason to hope for a continuous gradual increase in the cotton growing industry. If this takes place at a rate commensurate with the release and multiplication of better yielding strains from the Cotton Breeding Station, coupled with increased knowledge of better cultural methods, we may justly look forward to the future with confidence.

G. S. CAMERON.

Report of the Division of Irrigation for the Year 1930.

Consequent upon the reorganisation of the Agricultural Department, the Irrigation Branch received the status of a Division, but this did not entail any fresh grouping of the branches composing the Division.

During the year under review there has been a steady expansion in the work performed, particularly in regard to soil erosion, protection works and minor irrigation schemes, and, as the following report will show, it has been a record year in all respects.

In spite of the depression, there has been a steady demand for the services of the Government boring machines, and the number of boreholes sunk for private applicants (including railways) is a record, being forty-seven, as compared with thirty-five in the previous year.

The loan fund, provided for the purpose of making advances to farmers for the construction of irrigation and water conservation works, was drawn upon to an increasing extent.

At the request of the Nyasaland Government, Mr. Haviland visited Nyasaland and spent twenty-one days on a tour of inspection and advice on soil erosion protection works.

The Reconnaissance Survey Party continued investigations on storage sites in the Victoria district.

As usual the activities of the Division were of a very varied nature, comprising such matters as irrigation, water supply installations, boring, soil erosion and general agricultural engineering.

The summary below gives the approximate expenditure controlled and administered by this Division, together with estimate of cost of works advised upon during the calendar year, exclusive of ordinary advisory work.

SUMMARY.

General Boring Operations	£11,555
Purchase of Boring Equipment	230
Development and Installation Water Supplies in Native Reserves	8,820
Boring in Native Purchase Areas	2,000
Installation Water Supplies — Government Institutions and Townships	2,540
Surveys and Estimates for Water Supplies—Government Institutions	4,000
Water Supplies—Victoria-Limpopo Stock Route	450
Survey and Estimates for Works for Agricultural Department	3,000
Advance Approved from Irrigation Loan Funds	4,625
Engineering Works for Agricultural Department	3,800
Hydrography and Meteorology	900
Reconnaissance Survey	1,100
	£43,020

General.—The information sought by farmers this year has as usual been of a very varied nature, relating to the construction of general farm buildings, dipping tanks, well-sinking, water supplies, agricultural machinery and tractors, in addition to surveys and reports on irrigation and soil erosion.

The following summary shows the number of visits paid to farmers and others in connection with irrigation, soil erosion, water supplies and general enquiry for townships and Government institutions:—

Farm visits in connection with irrigation	168
Farm visits in connection with soil erosion	143
Other visits (townships and Government institutions)	97
Total	408
Acreage of new irrigable land investigated ...	1,917
Total acreage of irrigable land investigated to end of 1930	53,198

Five farmers' association meetings were attended and addresses delivered on soil erosion and irrigation schemes.

Eight lectures in agricultural engineering and soil erosion were delivered to the pupils at Matopo Agricultural School and at the Tobacco Experiment Station, Salisbury. Plans and estimates were prepared for the construction of residences and farm buildings at the Sand Veld Experiment and Pasture Research Station, Marandellas.

The erection of weighbridges at Gwebi and Matopos, the construction of a new water supply installation at Rhodes Matopo Estate and permanent improvements to the Malemi storm canal serving the Matopos Dam were also supervised.

A considerable amount of survey work in connection with demarcating the experimental plots at the sand veld station at Marandellas was carried out for the Division of Plant Industry.

The construction of a furrow to serve a considerable area of land in the Mutema Native Reserve (Sabi Valley) was supervised. As the reserve lies in an area of very unreliable rainfall, it is considered that the provision of irrigation will guarantee the growth of summer crops and thus obviate the necessity for famine relief from time to time.

Surveys and estimates were prepared in connection with seventeen water supply schemes for small townships and Government institutions, and of this number four were completed during the year, viz., those serving Shamva, Marandellas, Rusape and Banket.

Special reports were prepared in connection with loan applications for water supply schemes from Bindura, Que Que and Shabani town management boards. Advice was also given on the location of a suitable dam site for a proposed new water supply scheme for Gwelo. The number of visits paid this year in connection with the above operations is 408, an increase of 97 over the previous year's total. This increase is largely due to the more general attention being given by farmers to soil erosion protection works and small irrigation schemes.

A number of visits for soil erosion advice were carried out during February and March to farmers who had ploughed in green manure crops and wished to contour ridge their land. This is a development that is to be encouraged, as it enables the demand for soil erosion advice to be spread over a greater period of the year and the services of the engineers more efficiently utilised.

Unfortunately, a decrease in the number of farm visits paid in the Matabeleland circle has to be recorded, viz., 39 as compared with 62 in the previous year.

In this connection the irrigation engineer in charge of that circle reports as follows:—

"The present financial conditions of the farming community has been reflected in the decrease in the number of visits paid to farms. That this should have occurred is regrettable, as the financial status of individual farmers would undoubtedly have been greatly improved by the provision of water supplies for stock purposes and irrigation.

"The construction of weirs on rivers with a view to increasing stream flow is very necessary. This is a difficult matter for the farmer himself to deal with, on account of the expense involved and the fact that no direct returns are available from the money thus expended.

"I think it is necessary that money should be spent by the Government in this connection, and am convinced that the result of such expenditure would prove of inestimable value to the farming community."

Irrigation Reconnaissance Survey.—The survey party carried out field work from early in April until the end of November in connection with the Umshandige Gorge and Popotekwe Gorge projects, both of which are in the Victoria district.

The survey work carried out in the Umshandige project consisted chiefly of a more detailed survey of the gorge and a tacheometric survey along the proposed canal routes.

On the right bank a detailed tacheometric survey was completed for 5¾ miles on the high level canal location, and a level traverse line was run for a further 25½ miles on this location. The low level right bank canal was surveyed in detail for a distance of 8⅓ miles, but was then abandoned as no suitable irrigable land existed beyond this point.

On the left bank a detailed tacheometric survey was run for a distance of 28 miles to the main Victoria-Beitbridge road on Lochiel Farm.

The detailed survey of the gorge included a series of soundings taken over 40 sections across the gorge at close intervals. All canal line traverses were check levelled and 27 permanent stations, fixed by triangulation from farm beacons, were established.

The traverse survey of the conservation area was checked by means of triangulation from farm beacons, and no serious discrepancies were found.

Some 50 permanent bench marks were established along the canal locations. Two land inspectors of the Lands Department prepared a map from field observations showing the situation, extent and nature of all the irrigable land below the canal lines, and a detailed soil survey of the irrigable land thus demarcated was carried out by an agricultural chemist.

A low concrete gauging weir was constructed across the river just below its exit from the gorge, and a recording instrument is now in process of erection so that information will be available as to winter flow and the approximate flood run-off from the catchment in various seasons.

From these surveys it appears that an area of 3,000 acres of suitable irrigable land would be commanded by the scheme; the major portion of this area being located on unalienated Crown lands situated on the left bank of the river.

A dam 108 feet in height at the site selected would store 30,000 acre feet of storm water and would provide unrestricted irrigation for the full area of 3,000 acres during the worst three-year period.

The cost of construction of the storage dam and canals is provisionally estimated at £52,500. This preliminary estimate is liable to considerable modification when detailed designs and estimates have been prepared, but it is not considered that the estimate is likely to be considerably exceeded. An annual water rate of 30s. per acre would cover all interest, maintenance and redemption charges on the capital outlay if spread over a period of 40 years and assuming that full development is only reached 10 years after the completion of the scheme. This is a remarkably cheap water rate when compared with similar schemes in the Union and elsewhere. On this basis the growth of wheat, lucerne and mixed pasture grasses would be a payable proposition, and, situated, as this irrigable area is, near the main ranching areas from which cattle could be drawn and fattened for export, it is considered that the scheme is an essentially sound proposition and worthy of the fullest investigation by the Government.

A further point not to be overlooked in connection with this project is the favourable feature that the irrigable land is distributed in small blocks which will permit of the whole area being divided into farms of reasonable extent, each containing a moderate irrigable area of 50 to 100 acres.

At the end of September the survey party was shifted to the Popotekwe Gorge to the east of Victoria, and a detailed survey of the conservation area for a dam 126 feet in height at this point was completed before the party returned to Bulawayo in December to plot the surveys carried out during the season. The preliminary surveys show that another exceedingly economical storage site exists at this gorge, and the survey party during the coming season will determine the amount of irrigable land below the gorge and the cost of irrigating same.

Irrigation Loan Funds.—Loans have been available for irrigation, conservation works and water boring during the last eighteen months. During this period 28 applications have been approved for loans totalling £5,800, of which £4,390 have been paid out to date. Actually 42 applications for loans have been received to date, of which 14 have been refused.

The total of £5,800 is distributed as follows among the various types of works covered by the loans:—

(a) Irrigation works: £3,240 for 10 schemes totalling 270 acres.
(b) Repayment of boring charges: £2,260 for 15 farms with 26 boreholes.
(c) Soil erosion protection works: £300 on 3 farms.

Instalments of interest and redemption on eight loans approved during the previous year became due during the current year, and it is an encouraging feature to note that only two of these instalments are overdue.

It is anticipated that there will be a steadily increasing demand for these loans year by year as the facilities available become more generally realised. As these loans are definitely earmarked for reproductive works, it is a policy to be encouraged, and it is to be hoped that the facilities will not be withdrawn. Since May last the full expenses of the Reconnaissance Survey Party have been paid from this Loan Vote, the amount expended to date on this purpose being approximately £750.

Irrigation.—The number of new irrigation schemes advised on favourably during the year have totalled 62, with a total irrigable area of 1,917 acres, the average irrigable area per scheme being therefore about 30 acres.

The larger schemes investigated by the Reconnaissance Survey Party have not been included in the total of the irrigable areas approved.

As pointed out in last year's report the moderate extent of the irrigable area of the schemes constructed is a favourable feature, as the capital cost of these schemes is relatively small and the area can be economically developed by one individual.

It is interesting to note that according to the return published in the "Economical and Statistical Bulletin" for 21st August, 1930, there was a 25 per cent. increase in the area under irrigation in this Colony as compared with the previous season. Including citrus orchards and lucerne, the total area under irrigation in 1929 was 11,760 acres, and is a clear indication of the increased attention that is being given to mixed farming owing to the slump in the more spectacular crops. The most marked increase in a single crop was in the area under wheat, which expanded by 40 per cent.; and as the average yield also increased from 2.1 to 2.8 bags per acre, the local production of the crop was almost double that of the previous season, and amounted to 12,900 bags.

In spite of this increased production the value of wheat and wheaten products imported during the year amounted to £109,158, of which £37,165 was re-exported.

The only irrigated crop which showed a decrease in the area planted was winter potatoes, the area under cultivation being 8 per cent. less than in the previous year; but as the average yield per acre increased from 15.3 to 21 bags, the total local production of winter grown potatoes was 18,830, as compared with 14,940 bags in the previous season.

The declared value of potatoes imported amounted to £23,873, as compared with £20,760 in the previous year. It is also encouraging to note that the average yield per acre of all irrigated crops showed a substantial increase over those obtained in the previous season, with the exception of barley, the acre yield of which dropped from 6.5 bags to 5.9 bags.

The area under lucerne, although increasing, is still very limited and only amounts to 229 acres. As the average yield—viz., 3.9 tons per acre—compares favourably with that obtained in other countries, there will undoubtedly be a considerable increase in the area under this crop as the trade in export cattle develops.

An example of persistence and faith in an irrigation project has been displayed on Triangle Ranch, Ndanga district, where the expensive work entailed in the construction of the intake and head works of an extensive irrigation scheme from the Mtilikwe River was completed in July last after six years' steady effort.

The progress of this scheme will be watched with interest, as the potentialities of this portion of the low veld have to be seen to be realised; it is one of the few areas in Rhodesia where extensive irrigation schemes are practicable and where soil and rainfall conditions will justify the expense involved. It is hoped that this scheme will be an example of what can be achieved on the low veld under irrigation.

Another interesting scheme completed last year is one on New Year's Gift, Melsetter district, where 500 acres were put under irrigation at a cost of £100.

In the early stages of development it is intended to grow ordinary winter crops such as wheat, barley and oats, but later it is probable that tea will be the irrigated crop, as the unique experiment of growing tea under irrigation in this area is proving remarkably successful.

Soil Erosion.—Requests for advice on this subject continue to increase. The number of visits to farms on soil erosion matters totalled 143 this year, as compared with 124 in the previous year. The work was more evenly distributed throughout the year, as a number of farmers put in contour ridges at the end of the wet season on lands which had been under green manure crops.

At the request of the Nyasaland Government, Mr. Haviland visited that Colony, lectured at various centres and gave advice on numerous estates on the subject of soil erosion, and in all a period of 21 days was occupied on this tour and a full report was published in the *Rhodesia Agricultural Journal*.

Boring.—There was a decrease in the number of drilling machines in operation during the year, as one old machine operating in the native reserves was taken out of commission, and replaced by one of the newer machines, and there was no demand for the mining drill. Making allowance for non-working periods when drills were being shifted to new areas, the strength was equivalent to 10 2-3rd drills working for a complete year.

The summary of footage drilled, cost per foot and aggregate yield per 24 hours of water supplies developed is as under:—

Total depth drilled	19,311 feet
Footage drilled per working month per drill	150.9 feet
Number of boreholes sunk	139
Average depth per borehole	138.9 feet
Average charge (all boreholes), including casing and depreciation on plant	20s. per foot
Aggregate yield of successful boreholes	1,663,960 gallons per 24 hours
Percentage of successful boreholes	66.4 per cent.

In the following detailed summary is shown the cost of drilling for private applicants, on Crown lands, in native reserves, etc.

In the case of private applicants, transport, labour and fuel are supplied by the applicant, but in the other cases these are supplied by the Government, and the cost of these services, together with depreciation on the plant, included in the boring costs.

	Private applicants.	Government institutions.	Townships.	Crown lands.	Native reserves.	Native purchase areas.	Railways.
Total depth drilled, feet	5,420	864	...	4,281	5,512	2,385	849
No. of drill months ...	31.5	5.0	0.5	32.0	38.0	15.0	6.0
Footage drilled per working month per drill	172.1	172.8	...	133.8	145 0	159.0	141.5
No. of boreholes sunk ...	42	7	...	33	37	15	5
Average depth per borehole in feet ...	129.0	123.4	...	129.7	149.0	159.0	169.8
Average cost per foot, including casing ...	14/9	20/8	...	22/8	22/2	19/11	25/7*
Percentage of successful supplies	79.0	85.7	...	63.6	67.5	33.3	40.0

One borehole cleaned out and re-cased.

New records have been set up this year as to footage drilled, rate of drilling, and general lowering of costs, and great credit is due to the Boring Branch for so satisfactory a performance.

The percentage of successes remains practically constant year by year, viz., on an average one borehole out of three fails to yield a useful supply.

The average cost per foot of all boreholes drilled this year is 3s. 5d. cheaper than in the previous year and is 6s. 11d. less than the average cost in 1928. There has been a cheapening in cost for all classes of work with the exception of that performed in native reserves and native purchase areas, where costs are slightly higher than in the previous year owing to a few lengthy shifts which were necessary in moving to new areas. The most satisfactory feature is the fact that costs to private applicants again show the considerable reduction of 2s. 6d. per foot on the previous year's figure and 6s. 5d. per foot less than the cost in 1928.

During the last six years 20,614 feet have been drilled for private applicants at an average cost of 17s. 9d. per foot.

When it is considered that permanent deep-seated supplies of water are developed in these boreholes and that the cost of lining them is included, it is evident that well-sinking cannot compete with this low average cost. This good performance has been attained owing to the efficiency of the type of drill used and the drill personnel, and owing to the present policy of carrying out a steady and consistent programme of boring on Crown lands, which has enabled drills to be available in various districts and able to carry out private applications with the minimum amount of expense for railage and transport charges. Details of the work carried out by the drills operating under the general boring vote are given in Schedule II. attached to this report. The work performed by drills operating in the native reserves is included in the report of the Chief Native Commissioner. It will be noted

* This charge is not at ordinary schedule rates, as a footage rate of 22s. 6d. per foot, plus cost of casing and time lost in moving drill between sites, was quoted to the railways for this contract.

from the schedule that the results obtained by Drill No. 11, operating in the Gwanda Native Purchase Area, have been very disappointing, as out of eight boreholes sunk only one useful supply has been developed.

A very large portion of this purchase area has now been prospected for water, with negative results, and is therefore unsuitable for settlement. The wisdom of proving this area prior to settlement is, however, obvious, so that the expenditure incurred has not been wasted. The drill has now been moved towards the western portion of the area near the Tuli River, where better results are hoped for.

Water Supplies: Native Reserves.—In addition to the water boring operations in the native reserves, windmills, tanks and troughs have been installed at a number of the permanent supplies developed in the various reserves. Twenty-five complete installations have been erected at an average cost of £150 apiece, and three complete installations are on hand for erection next season. Further details of the work performed under this section are dealt with in the Chief Native Commissioner's annual report.

Water Supplies: Townships and Government Institutions.—During the year a number of water supply schemes for townships and Government institutions were investigated and reported on. Schemes to supply Shamva, Marandellas, Rusape and Banket were proceeded with and completed during the year, and the water supply scheme at Beitbridge township was also finally completed. An amended scheme for Bindura township, to comprise water supply only, was investigated, and detailed plans and specifications prepared. Reports and estimates for water supply schemes for Plumtree and Shabani townships were also prepared, and a report on the loan proposals of Shabani Board submitted to the Government. A report was prepared in connection with the loan application received for a proposed light and water scheme for Que Que township. Reports and estimates were prepared for water supply installations at Filabusi, Mtoko, Fort Usher, Gwanda, Mashaba, Gutu, Selukwe and Gokwe. The Gwelo Municipality obtained advice on the selection of a site for their proposed new water supply scheme.

Meteorology.—The work of the meteorological and hydrographic offices is directly supervised by the Hydrographic Engineer. The routine work consists of the classification of data obtained from local observations relating to the rainfall and climatic conditions in the Colony.

The change in the number of reporting stations was as under during the year:—

	Number 31.12.29	Number 31.12.30
Stations with automatic instruments	3	2
Barometric	11	12
Thermometric	47	54
Rainfall	550	530
	611	598

A considerable number of rainfall stations have been closed owing to the farms being no longer occupied.

The ideal distribution of gauges is one gauge per 120 square miles, and this has been accepted as a standard in future. Where existing stations are closer than this, they are being closed as opportunity offers, so there is unlikely to be any large increase in stations in future. All rainfall normals have been re-calculated, and a new normal rainfall map is included in the current year's meteorological report.

The increase in thermometric stations is due to recent developments in forecasting and preparing for the Airways service. The majority of these stations were visited during the year and personal instruction given, which is essential if accurate and reliable records are to be obtained.

A test barometer was taken to 11 of the barometric stations during the year, and the index errors of the barometers installed re-determined.

Weather Forecasting.—No definite progress can be reported in weather forecasting. A new map has been prepared in this office to a scale of 1 to.5 million for detailed work. The map was printed in the Government lithographic press. A new map has also been plotted to replace the existing general map, which is very inaccurate. It is hoped to get this printed in the near future. The additional information necessary to utilise the new forecasting methods has increased the time taken up by the forecast service.

Aviation Meteorology.—In accordance with the promises made to the Imperial Airways, Limited, the following information will have to be supplied when the service commences in June next:—

(1) Regular forecasts of weather to be expected en route from Pietersburg (Transvaal) to Mkeya (Tanganyika).

(2) Weather messages from stations along the route to aerodromes and aeroplanes in flight.

(3) Upper air data, wind velocities, cloud heights, etc.

Fourteen telegraph reporting stations along this route have been selected, suitably equipped with instruments and the observers instructed. Arrangements have been made with the police and Law Department, and the work is carried out at police posts and gaols for a remuneration of £2 per month; part of this extra expense will be provided under the Civil Aviation Vote.

The work entailed in the Salisbury office will be considerable, as weather maps will have to be prepared throughout the year, and forecasts in great detail will be necessary. The additional member of the staff appointed during the year will be transferred to Bulawayo, operating early in March, where upper air observations and a resident meteorological officer are required in connection with this organisation.

Information Published.—The regular information published during the year consists of the following:—

(a) Annual meteorological report.

(b) Monthly weather report in the *Rhodesia Agricultural Journal.*

(c) Weekly summary of rainfall.

(d) A daily weather report and forecast was issued during the rainy season and telegraphed to all departmental post offices.

(e) Daily records from five barometric stations were forwarded monthly to the meteorological office, London.

(f) A summary of the mean seasonal rainfall is cabled to Poona in April for use in the monsoon forecast.

(g) A summary of Bulawayo rainfall is cabled to Rio de Janeiro for use in forecasting rain in Ceara. Special weather reports, forecasts and upper wind data were supplied from time to time for aviation.

Hydrographic.—The routine work of this section comprises the collection of data relating to the storm and winter flow conditions of the chief rivers of the Colony, which is required in connection with the investigation of irrigation schemes and for the information of the Water Court. In all, 78 reports were prepared for the Water Court during the year. The information is obtained by means of:—

(1) Automatic recording instruments at gauging weirs and dams.

(2) Individual gaugings by members of the engineering staff while on tour.

A large flood recorder was erected on the lower Mazoe River this year and a recording gauge also installed at the Railways' weir at Sawmills.

There are now 13 automatic gauging stations in existence.

Owing to shortage of staff it has not been possible to reduce the records available and a hydrographic report has not been issued for three years.

Water Ordinance.—The writer sat as engineering assessor on four Water Courts during the year, one of which was a special court to deal with the Railways' use of water on the Salisbury-Umtali, Shamva and Sinoia sections.

In all, 87 applications were dealt with, of which 27 were for railway purposes, 2 for mining purposes and the remainder for irrigation.

Four of the irrigation applications were refused, so that in all 54 irrigation schemes were approved, for which authority was sought to irrigate 3,916 acres, and grants actually issued for the irrigation of 2,679 acres.

Publications.—The following contributions were made to the *Rhodesia Agricultural Journal* during the year:—

Chief Irrigation Engineer: Irrigation Notes (bi-monthly).

P. H. Haviland, B.Sc., A.M.I.C.E.: Soil Erosion Prevention in Nyasaland.

R. H. Roberts, B.Sc. (Eng.): Soil Erosion; Reinforced Brick Tanks; Reinforced Concrete Tanks; Low Concrete Dams.

B. G. Gundry, A.Inst.Mech.E.: Munktells Tractor.

Staff.—The staff of the Division was increased by one owing to the appointment of an officer for Bulawayo Observatory.

The staff was practically at full strength throughout the year, with the exception of the Boring Inspector, who was absent on long leave.

Acknowledgment is made of the loyal services rendered by the whole staff of the Division during the year.

C. L. ROBERTSON,
Chief Irrigation Engineer.

Schedule No. 1.

STATEMENT SHOWING RUNNING COSTS AND REVENUE EARNED BY THE DRILLS OPERATING UNDER REVENUE VOTE, AND THE DEPRECIATION ON THE CAPITAL VALUES OF THE BORING PLANTS PURCHASED FOR THE DEPARTMENT OF AGRICULTURE.

Drill No.	Period.	Running Costs.	Revenue Earned.	Remarks.
		£ s. d.	£ s. d.	
4	1.1.30 to 31.12.30	1,208 6 7	1,489 10 8	
5	1.1.30 to 31.12.30	1,836 16 11	2,231 8 4	
6	1.1.30 to 31.12.30	1,669 15 5	1,917 16 7	
7	1.1.30 to 31.12.30	1,603 19 4	1,936 4 10	
8	1.1.30 to 31.12.30	1,344 2 5	1,649 9 2	
9	1.1.30 to 31.5.30	524 12 2	617 4 6	Drill No. 9 operated under Revenue Vote to the 31st May, 1930. It then replaced Drill No. 1, which is worn out. It has therefore operated under Loan Vote on the Gwanda Native Reserve since August. To cover the depreciation on the plant for the five months the sum of £100 has been credited to Revenue Vote from Loan Vote.
	1.8.30 to 31.12.30	...	100 0 0	
10	1.1.30 to 31.12.30	1,424 14 4	1,603 2 9	
11	1.1.30 to 31.12.30	1,356 13 1	1,595 16 9	Drill No. 11 was purchased by the Native Department for work on the Native Reserves under Loan Vote, but as it was more economical to utilise Drill No. 3 in the Shangani Native Reserve, the revenue earned by Drill No. 11 is utilised for depreciating Drill No. 3, which belongs to the Agricultural Department. On the other hand, a sum of £240 has been added to the running costs of No. 3 to depreciate No. 11.
13	1.1.30 to 31.7.30	782 6 0	1,007 7 0	Drill No. 13 operated under Revenue Vote up to the 31st July, 1930. It was then sent to the Belingwe Native Reserve to operate under Loan Vote. The sum of £100 has been credited to Revenue Vote from Loan Vote to cover depreciation on this plant while it has worked in the Belingwe Reserve.
	1.3.30 to 31.7.30	...	100 0 0	
		235 18 8	...	Value of stores brought forward from 1929 to 1930 by Drills Nos. 5 and 7.
		...	40 0 0	Value of two second-hand boilers sold during 1929 from Drills Nos. 4 and 5, for which credit was not given in the 1929 statement.
		...	6 6 0	Value of Ford lorry sold in 1930.
		£12,087 4 11	£14,294 6 7	
		2,207 1 8		Balance of revenue earned over running costs to pay for depreciation on plant.
		£14,294 6 7		

CAPITAL VALUES OF DRILLING PLANTS PURCHASED FOR THE DEPARTMENT OF AGRICULTURE AND ALLOWANCES FOR DEPRECIATION DURING 1930.

Drill No.	Values at 1.1.30.	Transfer of tools from store during 1929 and 1930.	Total.	Depreciation.	Values at 1.1.31.	Remarks.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
3	905 0 11	50 0 0	955 0 11	223 13 1	731 7 10	
4	1,993 13 11	20 0 0	2,013 13 11	223 13 1	1,790 0 10	
5	2,028 15 10	...	2,028 13 10	223 13 1	1,805 2 9	
6	1,433 17 10	46 0 0	1,479 17 10	223 13 1	1,256 4 9	
7	1,341 8 0	55 0 0	1,396 8 0	223 13 1	1,172 14 11	
8	1,850 17 2	20 0 0	1,870 17 2	223 13 1	1,647 4 1	
9	1,661 3 11	...	1,661 3 11	223 13 1	1,437 10 10	
10	1,734 12 3	25 7 4	1,809 19 7	223 13 1	1,586 6 6	
13	1,898 12 6	10 0 0	1,908 12 6	224 3 0	1,684 9 6	
	326 7 4	226 7 4	100 0 0	...	100 0 0	Tools in store.
	13 14 0	...	13 14 0	13 14 0	...	Ford lorry sold during 1930 for £6 6s. Value shown on the 1929 statement as £20.
	230 0 0	...	230 0 0	180 0 0	50 0 0	Ford Express van for use in Matabeleland.
	£15,468 3 8	...	£15,468 3 8	£2,207 1 8	£13,261 2 0	
					228 19 0	Ford Express van purchased during 1930.
					£13,490 1 0	

Schedule No. 2.

SCHEDULE OF BORING OPERATIONS FOR 1930 FOR DRILLS OPERATING UNDER REVENUE VOTE.

Drill No.	Areas.	Formations.	No. of boreholes.	Total depth bored in feet.	Total number of successful boreholes.	Total supply of water in gallons per 24 hours.	Average cost per foot, including casing.	Maximum cost per foot, including casing.	Minimum cost per foot, including casing.	Remarks.
4	Nyamandhlovu and Bulawayo District	Basalt, sandstone, running sands	15	1,669	14	165,600	17/10	31/10	9/2	Boreholes drilled for private applicants who supplied transport, fuel and water.
5	Lower Gwelo District	Greenstone schist	8	908	6	82,080	28/5	30/6	17/8	For Crown lands. Government supplied transport, fuel and water. European area.
		Sandstone and greenstone schist	1	200	..	...	6/4	6/4	6/4	For private applicant. Applicant supplied transport, fuel and water. Note.—All casing was extracted from this borehole.
		Running sands, clay and granite	7	1,044	4	50,880	16/10	24/3	10/3	For Crown lands. Government supplied transport, fuel and water. Native purchase area. All casing was withdrawn from the borehole, which cost 10s. 3d.
6	Lomagundi District	Schist and quartzite	11	1,588	7	107,160	15/11	21/-	9/9	For Crown lands. Government supplied transport, water and fuel. Private applicants. Applicants supplied transport, water and fuel.
	Sinoia Area	...	5	942	3	62,400	11/3	22/4	5/5	All casing was withdrawn from the borehole, which cost 9s. 9d. and 5s. 5d.
7	Hartley District	Greenstone schist	4	492	2	26,400	32/1	40/-	25/7	For Crown lands. Government supplied transport, fuel and water.
	Wankie District	Basalt	5	812	2	72,000	25/7	25/7	25/7	Special contract rate for Rhodesia Railways; 37 feet drilled in borehole; still in progress on 31st December, 1930.
			...	37	...	...				
		Carried forward ...	56	7,692	38	566,520				

SCHEDULE NO. 2—Continued.

Drill No.	Areas.	Formations.	No. of Boreholes.	Total depth bored in feet.	Total number of successful boreholes.	Total supply of water in gallons per 24 hours.	Average cost per foot, including casing.	Maximum cost per foot, including casing.	Minimum cost per foot, including casing.	Remarks.
		Brought forward ...	56	7,692	38	566,520				
8	Mazoe District	Granite	3	317	2	25,200	39/11	49/1	28/3	For Crown lands. Government supplied transport, water and fuel.
	Salisbury District	Granite schist	11	1,479	10	175,920	14/3	18/9	8/6	For private applicants, who supplied transport, fuel and water.
	Marandellas District	Granite	4	639	4	36,720	14 1	18/3	11/10	For Government Experimental Farm, Marandellas. The farm supplied transport, fuel and water.
10	Banket	Crystalline schist	2	365	nil	nil	20/2	22/-	19/3	For Crown lands. Government supplied transport, fuel and water.
	Mazoe	Quartzite	10	1,130	6	199,200	13 1	35 6	8/-	For private applicants, who supplied transport, fuel and water. The casing was withdrawn from the borehole, costing 8s.
	Salisbury District	1	1	94	1	24,000	42/-	42/-	42/-	For Government institutions and Banket Village. Government supplied transport, fuel and water. This drill also cleaned out and re-cased an old borehole at Shamva Village, in addition to the work shown.
11	Gwanda	Gabbro Granite Basalt	8	1,175 166 ...	1	23,000	23/7	33/11	18/-	Boring on Crown lands in native purchase area. Government supplied transport, fuel and water. 166 feet drilled in borehole. In progress on the 31st December, 1930.
13	Victoria District	Granite	5	611	4	32,400	21/7	33.3	15/8	Boring on Crown lands. Government supplied transport, fuel and water.
			2	131	1	14,400	37/10	38/1	37/9	Boring, Government institutions. Government supplied transport, fuel and water.
			102	13,799	67	1,097,360				

Report of the Division of Forestry for the Year 1930.

Eleventh Annual Report.—The year has been one of progress and expansion—progress in afforestation and the study of methods best suited to this Colony, and expansion of the activities of the Forest Service.

The reorganization of the Agricultural Department in December resulted in a change of status of the Forest Service. From a Forestry Branch it was created the Division of Forestry.

During the year the Forest Service assumed control of the Wankie and Victoria Falls game reserves. A sketch map of the former area has been prepared, and valuable data regarding the distribution of the game, vegetation and water supplies collected. The reserve has immense possibilities for the production of valuable timber, which can go hand in hand with the conservation of game.

State forest activity continued apace. The unfavourable weather conditions early in the year reduced the contemplated afforestation programme considerably, especially in the Midlands. In spite of this the area afforested was 1,334 acres—a figure which is equal to any two previous years in the history of the Forestry Division.

The Forest Nursery, Salisbury, continues its good work of distributing trees of both ornamental and commercial utility throughout the country. The beautification of many towns and farms, particularly Salisbury, is due to a great extent to this institution.

Tree growth on the Mtao Forest Reserve—the first reserve to be acquired—has vindicated the choice of the locality as the best in the Colony outside the highest rainfall zones. The introduction of soil inoculation on this reserve will have far-reaching effects, in that the locality has now shown itself to be admirably adapted to the growth of conifers, in addition to certain hardwoods.

The Stapleford Forest Reserve, where operations have now been carried out for three years, has satisfactorily passed through the initial stages of organization. The completion of the main building programme and a portion of the main road through the reserve will enable the labour staff to concentrate on afforestation for some years to come. The bulk plantings are giving every satisfaction.

Operations in the Kalahari Sand forests of Western Matabeleland have now embarked on their sixth year. Five years' actual experience has served to strengthen the conviction always held by the Forest Service into complete certainty that rigorous fire protection is of vital importance if these forests are to achieve their true productive capacity.

The European labour afforestation operations at Mtao expanded considerably during the year, owing to the steady influx of men from the beginning of January. At the beginning of the year there were 80 employees and at the end of December there were 121 on the roll.

The interest in forestry on the part of the general public was maintained, and it is gratifying to observe a greater tendency among farmers and general tree planters to raise their own nursery stock.

The formation of the first association of its kind in Southern Africa—the Prince Edward School Forestry Association—is worthy of particular mention. The association has not functioned in name only, but has made a splendid beginning with its afforestation programme. It is hoped that other schools will follow this admirable lead.

An outstanding feature of the year's work was the completion by Mr. Henkel of a vegetation map of the Colony. A knowledge of the distribution of the vegetation types is naturally invaluable to the forester, especially in a new country where afforestation is still feeling its way. Œcology, however, has a wider significance, which is felt by the agriculturist, the stockbreeder and even the miner, and it is hoped that the map now prepared will pave the way to the elucidation of the many problems connected with the land which now beset this Colony.

The departure of Mr. J. S. Henkel, who proceeded on leave pending retirement towards the end of the year, has deprived the Southern Rhodesia Forest Service of its founder and first Chief Forest Officer.

Mr. Henkel's unbounded enthusiasm in his work was a revelation to all with whom he came in contact, but he tempered this enthusiasm and optimism with a stern practical-mindedness and a gift for organization, the result of which a review of the last year's work will reveal.

As a driving force in organizing and administering the operations of the Forest Service, Mr. Henkel held the respect of all his subordinates, but as a friend and one who took a personal interest in each member of his staff he inspired their sincere regard.

(1) State Forests.—The areas of State forests at the end of the year were as follows:—

Description.	Area on 1st January. (Acres.)	Added during the year. (Acres.)	Total area at 31st December. (Acres.)
(a) Reserved Forests	666,404	—	666,404
(b) Unreserved Forests	192,000	—	192,000
(c) National Parks and Game Reserves	224,000	3,297,520	3,521,520
Totals	1,082,404	3,297,520	4,379,924

(2) General Management.—The surveying and marking on the ground of blocks and compartments were continued on all forest reserves. A provisional but valuable map of the Wankie Game Reserve was prepared. Work carried out conformed satisfactorily with the operations laid down in the annual plans of operations prepared for all stations. In the Gwaai Forest Reserve a valuation of the commercial timbers was commenced late in the year. The collection of data as to the rate of growth of certain Kalahari Sand trees was continued and valuable figures are being obtained.

Preliminary figures obtained on the Mtao Forest Reserve show that a stand of *Eucalyptus resinfera* seven years old, with 810 trees per acre, gave a volume down to three inches in the round of 2,644 cubic feet per acre.

(3) Protection.—All forest reserves, the unreserved forests at Masue and Fuller-Kesi and the Wankie Game Reserve were regularly patrolled. One native was convicted for trespass and firing forest at Mtao. A European was fined £10 for poaching in the Wankie Game Reserve.

Fire protection as usual played an important part in the year's operations, and on all reserves belts were cleared or burnt, with the objects of safeguarding primarily plantations or young indigenous regeneration and secondarily old indigenous forest for the conservation of organic matter.

On the Stapleford Forest Reserve two small fires burning a quarter of an acre in all of grassland were started by lightning, but were extinguished by rain which followed immediately after.

On the Mtao Forest Reserve the excessively dry conditions of early spring made the fire menace greater than usual. A fierce fire in late September swept over 5,350 acres of indigenous forest. The intensity of the fire was increased by the fact that much undergrowth had previously been killed back by frost. A strong wind raging at the time caused the fire to jump the external fire belts and gain access to the reserve. Four smaller fires over 150.39 acres also occurred. Two of these passed through 7.39 acres of plantations, but fortunately the young trees only suffered minor scorching.

On the Kalahari Sand areas protection operations were continued, on the whole with satisfactory results. It is gratifying to report that no fires occurred in the Masue area, where 115 square miles were protected. In the Fuller-Kesi section and Gwaai Forest Reserve, however, where 80 square miles and 468 square miles had been protected, fires occurred over 35 per cent. and 19.2 per cent. of the areas respectively.

Of the grand total of 663 square miles protected in the Kalahari Sand forests, 17.8 per cent. was traversed by fire, as against 17 per cent. of the 440 square miles protected during the previous year.

It was possible during the year to obtain more European supervision of fire protection than had hitherto been the case, but until European supervisors are stationed permanently in each area the lack of initiative of the native must always remain a serious handicap in effective fire fighting.

Injury to young plantations from animals is confined mainly to field rats and spring hares. Field rats have caused damage at Stapleford. They have attacked *Cupressus lusitanica* only, especially in areas where heavy grass growth is encountered. The difficulty is being overcome by planting this cypress in localities where grass growth affords insufficient protection for the pest, and experiments will also be made with a rat virus which is to be introduced. Depredations from spring hares are noticeable among young pines. It has been possible, however, to check this damage by shooting.

Little damage is suffered from insects in plantations.

On the Kalahari Sands the usually almost complete defoliation of *Burkea africana* ("Mukarati") and *Gleditschia africana* ("Msenye" or "Mubako") by the caterpillar of a Saturniid moth was much less severe than in previous years. Heavy late frosts may account for the mild invasion.

Frost damage was very noticeable during the middle of September. The newly-flushed foliage of many indigenous trees was killed back, while exotics such as *Eucalyptus saligna, E. maculata, E. citriodora, E. microcorys, Cedrela toona* and *Quercus pedunculata* suffered to a considerable extent. In no recorded case were conifers affected.

The prolonged drought caused much dying back of trees grown on shallow soils. In the towns many fine old trees succumbed entirely.

The unfavourable dry conditions which prevailed early in the year seriously hampered planting at Mtao, with the result that the annual planting programme was greatly curtailed.

(4) Silviculture.—(a) *Natural Reproduction.*—On the Kalahari Sand forests a moderate seed year was experienced among indigenous trees of commercial importance. With the exclusion of fire the regeneration of these forests from seed is a simple matter. The excellent rains towards the end of the year resulted in the prolific germination of *Brachystegia randii* ("Msasa") and *Berlinea globiflora* ("Mutondo").

Exotic trees such as *Acacia mollissima,* various eucalypts, *Cupressus lusitanica, Callitris* spp., *Jacaranda mimosæfolia* and *Cedrela toona* have been observed to regenerate freely from seed.

(b) *Artificial Reproduction.*—The difficulty of successfully establishing young pines in certain areas of the Colony where conditions are suitable for tree growth appears to have been overcome. Experiments in inoculating new soil with a certain fungus have given gratifying results. The procedure followed is to introduce soil taken from a thriving pine plantation in which it is known that the fungus is present to nurseries where pines were being raised.

Within a few weeks young transplants, which had hitherto borne a sickly yellow, stunted appearance, took on a healthy green tinge, and when set out in the field continued their normal healthy growth. In the Umtali district nine-months-old pines raised in inoculated soil were thirteen inches in height, as against uninoculated nearly four-years-old plants which had made only four inches of growth.

The afforestation operations carried out during the year were as follows:—

Station.	Total area afforested 31.12.29. (Acres.)	Area afforested 1930. (Acres.)	Total area afforested 31.12.30. (Acres.)
Forest Nursery	36.50	...	36.50
Mtao	1,286.42	202.77	1,489.19
Stapleford	733.91	1,131.80	1,865.71
Total	2,056.83	1,334.57	3,391.40

(c) *Nurseries and Sales of Seeds and Transplants.*—The Forest Nursery, Salisbury, which is maintained primarily for the distribution of seed and plants throughout the Colony, continued to flourish. There were 759 visitors to the nursery during the year. Nurseries on the forest reserves are used mainly for raising plants for State afforestation. New nurseries were established at Stapleford and at Eastfield, Mtao. During the year 3,108,880 plants were raised and 2,147,487 distributed and planted.

(d) *Silvicultural Notes.*—Bulk plantings of *Pinus insignis, Pinus patula, Pinus pinaster, Cupressus lusitanica, Cupressus torulosa* and *Eucalyptus globulus* show great promise at Stapleford. On the Mtao Forest Reserve *Eucalyptus punctata, E. saligna, E. maideni, E. maculata, E. botryoides, E. viminalis, E. tereticornis, E. microcorys, Pinus insignis, Pinus pinaster, Cupressus lusitanica, Cupressus torulosa, Callitris calcarata* and *C. robusta* are all thriving. After five years of unsatisfactory growth *Pinus halepensis* is now promising well.

On the latter reserve, in view of the success achieved with soil inoculation, much larger areas of pines will in future be laid down.

Of indigenous trees it is interesting to record that for the first time in five years *Ochna pulchra* ("Munyelenyele") was observed to flower and seed at Mtao. On the Kalahari Sands of North-Western Matabeleland this tree did not flower profusely, whereas in the previous season it bore heavy crops of fruit. It is probable that the fruit, which has a high saponification value, may be of commercial importance.

The extraordinary vitality of indigenous trees is amply explained by the provision by nature of exceedingly reliable root systems. In the Kalahari Sand areas seed of *Baikiæa plurijuga* ("Rhodesian Teak"), *Copaifera coleosperma* ("Rhodesian Mahogany"), *Pterocarpus angolensis* ("Bloodwood" or "Mukwa") and *Afzelia cuanzensis* ("Pod Mahogany") were sown and germinated five years ago. The stems are now only eighteen inches, twenty-four inches, nine inches and nine inches respectively in height. The root systems, however, extend and ramify to a great depth, which can literally be measured in yards.

(5) Exploitation.—At Stapleford and Mtao small quantities of indigenous timbers are sawn for use on the reserves, mainly in building, bridge construction and furniture.

Operations in the Kalahari Sand forests were continued by two timber concessionaires, the Zambesi Saw Mills, Limited, on an area north of Wankie and the Rhodesia Native Timber Concessions between Nyamandhlovu and Dett. Exploitation by these concessionaires was supervised by the Forest Service on behalf of the Department of Lands. Revenue from these concessions is paid to the Department of Lands.

(6) Roads, Communications and Buildings.—At Stapleford the main road was extended a distance of 3,559 yards, a timber bridge with a 20 feet span, stone culverts and 6,770 yards of bridle paths were constructed. At Mtao the main road was extended for a distance of 2,200 yards. Roads and bridle paths were kept in repair.

The telephone line connecting Stapleford with Penhalonga was completed early in the year. At Stapleford officer's and apprentices' quarters were completed, and two steadings consisting of tool sheds, carpenter shop, ration and seed stores erected with reserve labour. A new native compound was built.

At the Mtao Forest Reserve building operations covered the erection of officer's quarters, apprentices' quarters and native compound of five huts at Eastfield; additions to the forester's quarters and the erection of nine huts and a bathroom at the European relief camp; and additions to the manager's quarters and native compound at Fairfield.

(7) Livestock.—The livestock on hand at the end of the year for all stations totalled 189 oxen, 16 mules, 14 donkeys, and 3 horses, all of which are in good condition.

(8) Revenue.—The revenue for the year, including free issues from nurseries and excluding timber royalties paid to the Department of Lands, was £2,322 0s. 10d.

(9) Expenditure.—Expenditure for the year, apart from salaries and allowances, but including apprentices' wages, was £17,019 6s. 7d.

(10) Administration.—The staff of the Forest Service at the end of the year, exclusive of temporary labour, consisted of:—1 Chief Forest Officer, 1 Acting Chief Forest Officer, 3 District Forest Officers, 1 Horticulturist and Nurseryman, 5 Foresters, 1 Game Warden, 1 Assistant Manager, 5 Apprentices and 1 Clerk.

(11) Private Forests.—As far as the shortage of staff permitted, efforts were made to comply with requests for visits of inspection from farmers, estates and public bodies. During the year officers of the Forest Service delivered 24 lectures on forestry matters, attended 3 agricultural shows and visited and advised on 95 farms and estates.

The head office co-operated with the Arboricultural Society in the distribution of seed, purchased with Government aid.

(12) General.—The Forest Service continued to devote much of its time to advisory work in connection with forestry.

School Afforestation.—As a result of the recommendation in the report of the Education Commission, 1929, that "Opportunity should be taken to stimulate interest in forestry by encouraging schools to obtain an area and plant it with trees of economic value as an endowment for the school in future," the Prince Edward School Forestry Association, Salisbury, was formally constituted on the 8th April, 1930. Fifty acres of land near the school were obtained on lease from the Municipality, and all operations necessary for the planting and protection of this area were set on foot. Lectures and field instruction on nursery work and planting were given to the school by the Forest Service. At the end of the year several thousands of transplants had been raised by the school and an area of ten acres planted with various exotic trees.

National Parks and Game Reserves.—On the 1st March, 1930, the Forest Service assumed control of the Wankie Game Reserve, which had hitherto been under the administration of the Chief Entomologist since its inception in February, 1928. The game reserve, defined by Proclamation No. 8 of 1930, is situated in the north-western portion of the Colony, in the Wankie district, and covers an area of approximately 5,093 square miles. The geological formation of the major portion of the area is Kalahari Sand, but on the north granite and basaltic lavas are encountered. The vegetation consists of woodland and grassland. The woodland types consist of Msasa, Rhodesian Teak, Mfuti, Sinanga (Acacia) and Mopani, each type with its characteristic associates. The Acacia and Rhodesian Teak types are the most widely distributed.

The water supply, though on the whole poor, is sufficient for the needs of game. There are twenty-five watering places, mostly "pans," which hold water throughout a normal year, but only eight of these can be relied on after a bad season. Many smaller "pans" exist in the Sinanga belts which hold water for a few months after the rains. By artificial means it is possible at little expense to improve the less permanent supplies.

The reserve is well stocked with wild animals, of which the following are known to occur:—Elephant, giraffe, eland, buffalo, sable, roan, koodoo, wildebeeste, gemsbuck, waterbuck, bushbuck, reedbuck, impala, duiker, steenbuck, Sharp's steenbuck, klipspringer, tssessebe, zebra, warthog, ostrich, rhinoceros, hyena, wild dog, lion, leopard and vultures. Many of these animals occur in great numbers, especially elephant, giraffe, eland and sable.

The duties of the game warden are manifold and include the protection of game within the reserve, the study of the habits of the animals, the mapping of the topographical and vegetation features, the maintenance and

improvement of water supplies, the organization of a system of patrol for the prevention of poaching and limiting the migration of game, the destruction of vermin and the capture of game for scientific purposes.

During the year the vermin destroyed included five lionesses, six leopards, seventeen hyenas and eight wild dogs.

Matopo National Park and Game Reserve.—Owing to the shortage of staff no steps were taken during the year to inaugurate active control of this area, which is to be administered by the Forest Service.

Victoria Falls Game Reserve.—A preliminary survey of the area, which comprises 38,000 acres, was made during the year, and it is proposed shortly to introduce measures of patrol and protection on the lines similar to those in operation in the Wankie Game Reserve.

Trout Acclimatization.—The trout liberated in the Odzani River on the Stapleford Forest Reserve during the preceding year are thriving beyond all expectation. A further supply of 8,000 ova of rainbow trout from the Umtali branch of the Angling Society was hatched on the reserve during the year. A 90 per cent. hatch was obtained in August, and in September the young fry were liberated in the Odzani stream. Constant patrol of the stream is exercised for protection against man and animals.

Publications.—The publications during the year, excluding articles for the public Press, consisted of (1) "Forests and Forestry in Southern Rhodesia," by J. S. Henkel; (2) "Utilization of Wood in Southern Rhodesia"; (3) "Conversion and Disposal of Timber"; (4) "Fencing"—the three latter by T. L. Wilkinson, M.Sc., B.Sc.F.

Vegetation Map of the Colony.—A provisional map showing the distribution of the vegetation types of the Colony was prepared by the Chief Forest Officer. It is hoped that this map will be published shortly.

The compilation of a first vegetation map offered many difficulties. The vegetation types are not stable formations. Within each type there are sub-types brought about by local topographical soil and geological features. There are, for instance, within each type kopjes, narrow ridges and areas of poorly drained soil (vleis), each having a range of species adapted to these special conditions. Other localities, also poorly drained, carry a type of vegetation different from the dominant type on surrounding better-drained land.

In places the types are indicated in a diagrammatic manner, for where information was lacking recourse was had to interpolation of facts provided by geological, orographic and meteorological data. A tabulated key to the vegetation types appears as Appendix "A."

E. J. KELLY EDWARDS,
Acting Chief Forest Officer.

TABLE OF TYPES OF VEGETATION.

Equivalents.	Type.	Symbol.	Distribution and Chief Associates.
Grassland	(i.) Mountain Grassland	g	Grassland surrounds the patches of mountain forests along eastern border and forms zone between closed forest and open forest.
	(ii.) Plateau Grassland		Extensive on main plateau; often with trees and shrubs on termite mounds.
	(iii.) Vlei Grassland		Extensive and numerous throughout open forest in valleys and flats where soil becomes waterlogged.
Woodland—			
A. Closed Forest	(i.) Mountain Forest	h	Upper, eastern and southern slopes of mountains on eastern border, with *Cussonia umbellifera*, *Aphloia theaformis*, *Croton sylvaticus*, *Albizzia chirindensis* *Podocarpus milanjiana*, *Widdringtonia whytei*, etc., at higher elevations, *Khaya nyasica*, *Lovoa swynnertonii*, etc., at the lower elevations.
	(ii.) Fringing Forest	r	Belts along streams and rivers in open forest areas. Typical species: *Syzygium cordatum*, *Chrysophyllum argyrophyllum*, *Mimusops* spp. At middle and low elevations *Acacia albida*, *Acacia campylacantha*.
B. Open Forest (tree veld)	(i.) (a) Muhatja (*Parinarium mobola*)	p	Main plateaux. Associates: *Protea abyssinica*, *Faurea saligna*, *Faurea speciosa*. The type is extensively invaded by msasa.
	(b) Mangwe (*Terminalia sericea*)	t	South-west part of main plateau. Associates: *Burkea africana*, *Peltophorum africanum*, *Combretum* spp.: grassland abundant.
	(c) Thorn (*Acacia* spp.)	as	Chiefly on clay soils on lower rainfall areas. Associates: *Acacia karroo*, *Acacia rehmanniana*, *Acacia benthami* along western border; *Acacia giraffæ* frequent. Grassland abundant within the type.
	(ii.) Mahobohobo (*Uapaca kirkiana*)	u	On ridges, heads of valleys, bases of kopjes in eastern portions of Colony; frequently pure: grasses poorly developed.
	(iii.) (a) Msasa (*Brachystegia randii*)	b	Occupies 30-in. to 40-in. rainfall zone. Extends to north-west on deep Kalahari sands. Often pure, but generally associated with mutondo (*Berlinea globiflora*).
	(b) umGusu (*Baikiæa plurijiga*)	ba	Occupies Kalahari sand areas north-west of Colony. Large areas invaded by msasa. Associates: *Copaifera coleosperma*, *Gleditschia africana*, *Ricinodendron rautanenii*, *Diplium simii*.
	(iv.) Mfuti (*Brachystegia woodiana*)	bw	Occupies extensive areas in northern part of Colony. Associates: *Afzelia cuanzensis*, *Aformosia angolensis*, *Diospyros mespiliformis*, *Terminalia torulosa*; grasses poorly developed.
	(v.) Mopani (*Copaifera mopane*)	c	Extensive in low veld, in Limpopo and Zambesi Valleys. Associates: Baobab (*Adansonia digitata*), Knobthorn (*Acacia nigrescens*), Palms (*Hyphæne ventricosa*). Thickets of thorny shrubs frequent.

Note 1.—In open forest grass predominates as ground covering.

Note 2.—The mountain acacia (*Brachystegia tamarindoides*) is found on rocky kopjes in open forest throughout eastern and middle portions of the Colony, extending from highest to lowest elevations; grassland poorly developed.

Note 3.—Each open forest type has many species more or less confined to the type limit. Numerous species occur having a range extending to all open forest zones.

Note 4.—Within the open forest types there are extensive areas of poorly drained soil occupied by species of *Bauhinia*, *Terminalia*, *Combretum* and *Pterocarpus* and many other species.

Report of the Branch of Chemistry for the Year 1930.

General.—The main activity of the Chemistry Branch is the accomplishment of the analytical work that it is required to carry out under the existing organisation.

The routine duties of the branch consist of the following:—

(1) Analysis of soils, water, manures and agricultural products, submitted by farmers and other branches of the Agricultural Department.

(2) Analysis of samples taken under the Ordinance governing the sale of fertilisers and farm foods.

(3) Cattle dip and toxicological analysis for the Veterinary Department.

(4) Standardisation of glassware under the "Dairy Produce Act, 1928."

Summary of Routine Analyses.—A list of the samples submitted and analysed during the year is presented in the following table:—

Soils	330
Sub-soils	16
Manures and fertilisers	39
Farm foods	16
Cattle dipping fluids	17
Toxicological	80
Waters	24
Limestone and rocks	14
Glassware (standardised)	94
Insecticides	2
Forensic	18
Vegetable products	206
Miscellaneous	19
	875

Advisory work by correspondence and interview forms a further important activity of the branch and occupies a considerable amount of the time of the senior officers of the staff. Assistance on chemical problems is rendered to commercial firms and to other Departments of the Government as well as to the agricultural community. On instructions, the advisory work previously carried out by this branch in connection with animal nutrition has been discontinued, and matters of this nature are now dealt with by the Senior Animal Husbandry Officer.

A considerable number of requests were received from farmers and farmers' associations for an officer of this branch to visit their farms and to address a meeting of their associations. Every effort was made to meet these demands, but it was not possible, owing to pressure of work in the laboratory, to meet all the requests, particularly in the case of personal visits to farms.

Soils.—Of the 330 soils examined in the laboratory during the year under review, 138 represented samples taken by an officer of this branch while making a soil reconnaissance in connection with the Umshandige Gorge irrigation project. Chemical analysis of these samples is not yet fully completed, but a report will be issued upon them in due course. The majority of the other soils examined were from cultivated lands which had failed to give satisfactory crop yields and were submitted by farmers for advice as to their future cultural treatment; others had been obtained from virgin land and were submitted for a report upon their suitability for various crops.

None of the samples examined were found to possess abnormal features such as to call for special reference.

Manures and Fertilisers.—Of the 39 samples analysed under this head, 15 represented samples taken under the Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance.

It is gratifying to note that with one exception these samples were found to conform to their guaranteed analysis. It would appear, therefore, that the action of the Department in notifying manufacturers and vendors that the regulations in connection with the sale of fertilisers would in future be rigidly enforced is bearing fruit and that manufacturers are taking more pains to see that the fertilisers manufactured by them for sale in the Colony are in accordance with their guaranteed composition.

Farm Foods.—Only one of the 16 farm foods analysed during the year was taken under the Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance, and this product was found to be below its guarantee and outside of the limits of error allowed under the Ordinance. This farm food was the product of the same manufacturer as the fertiliser that was found to be below its guarantee, and it was evident from the analysis that the same material had been registered and was being sold both as a fertiliser and a farm food. A number of the remaining 15 foodstuffs analysed were submitted by commercial firms for analysis for the purpose of obtaining the data for registration with the Department.

In view of the fact that instances have come to the notice of this branch where vendors of farm foods have been selling products that were not registered with the Department, a notice has once again been published in the *Government Gazette* and local newspapers drawing attention to the necessity of registering with the Department of Agriculture all fertilisers and farm foods intended for sale in the Colony.

Cattle Dips.—Reports upon 17 cattle dipping fluids were forwarded to the Chief Veterinary Surgeon.

Toxicological Analyses.—Eighty toxicological analyses were carried out during the year, chiefly to ascertain whether mysterious deaths of cattle were attributable to poisoning. In 35 of the specimens received arsenic was found in sufficient quantity to indicate that death in each case was probably due to arsenical poisoning, and in a further 16 cases arsenic was detected, but not in sufficient quantity to state definitely that the death of the animal was due to this cause. It would appear that the adage "Familiarity breeds contempt" is applicable to many farmers who handle dip, as there is no doubt that the average farmer realises the potency of arsenite of soda, and yet the heavy mortality among cattle in the Colony from this poison is undoubtedly attributable to the careless handling of cattle dip.

Waters.—Twenty-four waters were examined during the year. Analysis was required to determine the suitability of nine for irrigation purposes, one for drinking purposes, and the remaining 14 were subjected to special analysis as required by the Irrigation Branch in connection with an experiment being carried out on soil erosion.

Limestones and Rocks.—Fourteen samples were reported upon, most of which were low grade travertine limes forwarded by farmers for advice as to their suitability as ameliorants for soil acidity. One sample, however, received from Umtali, proved to be an almost pure limestone containing an equivalent of 99 per cent. calcium carbonate.

Glassware.—Ninety-four pieces of glassware were submitted for standardisation as required under Government Notice No. 279. These consisted of 60 Babcock milk test bottles and 34 Babcock cream test bottles. Fourteen of the former were destroyed, as they did not conform to the standards laid down in the Ordinance.

Vegetable Products.—Classified under this head are samples of grass, tobaccos, lemons, *Acacia giraffæ* beans, oats, ensilage, maize, distillers' grains and sunflower plants.

A total of 122 grasses were analysed during the year, 115 of which were carried out in connection with the pasture improvement research, and the other 7 were performed for the Pasture Research Station at Naivasha, in Kenya.

Ten different samples of lemons were analysed for their citric acid content at the request of the Horticulturist.

Fifteen samples of different tobaccos were analysed at the request of the High Commissioner's Office in London, and a report upon these was forwarded to the Acting Secretary of the Department of Agriculture.

The *Acacia giraffæ* beans were analysed at the request of the Chief Forest Officer, and a report was made upon them for publication in the *Rhodesia Agricultural Journal.*

The grains and grain products were analysed to determine their feeding value for stock at the request of the Chief Agriculturist.

Miscellaneous.—Included under this head are samples of lubricating oils, tannin materials, deposits in water filter at the Salisbury Experiment Station, telephone cables submitted by the Chief Engineer of the Post Office, and a number of salt licks sent in by the game warden at Wankie.

Two of the latter are of interest, as one was found to contain approximately 53 per cent. of sodium chloride and 33 per cent. of sodium sulphate (Glauber salts), and another approximately 82 per cent. of sodium chloride and 9 per cent. of sodium sulphate. It was stated by the game warden that this latter salt was found crystallising out on the top of pools during the dry season and was collected by natives and used for cooking purposes.

Forensic.—During the absence on leave of the Government Analyst the analyses of waters and forensic work usually carried out by this officer in the Public Health Department were undertaken by this branch. Altogether 24 various specimens were received and analysed, consisting of Chinese preparations, waters, meat, dogs' stomachs and human viscera.

Investigational Work.—The large number of routine samples which have to be dealt with during the year demand practically the whole attention of the staff and leave very little time available even for investigation into the suitability of new methods of soil analysis to local conditions. The activities of the branch are moreover severely handicapped by unsuitable accommodation and the extreme inadequacy of the plant. Until greater facilities are provided, the research work of the branch is bound to be extremely limited.

The major research at present being carried out is in connection with the improvement of natural pastures, and the prosecution of this work has only been made possible by the action of Government in providing a specific grant for this purpose, which has allowed one chemist to be relieved of all routine duties and to confine his whole attention to this problem.

The following are the experiments at present in progress:—

1. *Citrus Fertiliser Trials.*—The experiments laid down by this branch in collaboration with the British South Africa Company on their citrus estates at Mazoe and Umtali in 1923 are still being continued. These experiments were commenced with the object of determining the influence of fertiliser treatment with nitrogenous, phosphatic and potassic fertilisers applied individually and in different combinations on the yield, quality and texture of the fruit. The results so far obtained at Mazoe indicate that the best yield of fruit is obtained by the use of a fertiliser containing all three of the essential manurial constituents. It is also of interest to note that from a commercial standpoint the fruit from this group was of a good average quality, the thickness of skin, density and solids to acid ratio being approximately the average of the other fertilised groups. The second best yields were obtained from the trees receiving nitrogen and phosphorus without potash. It is rather a significant finding that where phosphorus was omitted from the fertiliser treatment the quality and quantity of the fruit were generally inferior.

The results obtained from Umtali are much more difficult of interpretation than those from Mazoe, and it would appear as if this is due to the marked difference in the inherent vitality of the trees being used in the trials at the Premier Estate. At Mazoe all trees showing an uncongenial bud union were grubbed out, but at Umtali this practice was not adopted, and it is noticeable here that the healthiest and most productive trees are those having a congenial bud union. As the percentage of such trees in each group is variable, it is impossible to determine the extent to which this factor is masking the results, but the trials are being continued, as it is possible that the influence of the different fertiliser treatments may eventually become more apparent.

2. *Manuring for Maize Production.*—In 1926 a series of plots were laid down at the Salisbury Experiment Station with the object of comparing the relative values of raw rock phosphate and the standard bone-and-superphosphate mixture as fertilisers for maize. The results obtained over three seasons were published in the December, 1929, number of the *Rhodesia Agricultural Journal*, but it was decided to continue the experiment over a period of five years. The results for the season 1929-30 were fully in accord with those obtained over the previous three years.

RESEARCH INTO THE IMPROVEMENT OF NATURAL PASTURES.

Pasture Research Station, Matopos.—The total area of land made available for pasture research at Matopos is approximately 240 acres, of which about 180 acres consist of a heavy black clay loam derived from basement schist and the other 60 acres of a coarse-grained, poor-bodied, granitic sand. The two soils are divided by a permanent stream known as the Manzi Bomvu River.

The black land carried a fairly heavy growth of sweet thorn trees (*Acacia karroo*), and although inclined to waterlog rather readily in the wet season, nevertheless carried a good growth of sweet grass of good grazing value.

The sand veld area is devoid of trees and carried an exceedingly scanty growth of grass; it is also of a very rough nature and contains many outcrops of granite boulders.

The plan of research in progress at present is designed to determine the following points:—

(1) The influence of regular cutting on the mineral and protein composition of the grass.

(2) The normal seasonal variation in the composition of the grass.

(3) The influence of treatment with various fertilisers on the yield of hay and the botanical and chemical composition of the herbage.

(4) The influence of treatment with various fertilisers on the carrying capacity of the land and the rate of growth and productivity of young growing animals.

The black land has been cut up into accurately surveyed 10-acre paddocks and the sand veld area into 5-acre paddocks. The former was cleared of all bush and trees, except a reasonable number of large trees, which were left for shade purposes. A weigh-bridge has been installed for the purpose of weighing the grazing animals and measuring any increase or decrease in their weight that may result from the influence of the fertiliser treatment on the grazing. The whole of the preparatory work in connection with the carrying out of the experiments on this station has now been completed and the work is in full progress.

Pasture Research Station, Marandellas.—Approximately 500 acres of land on the Government sand veld station at Marandellas has been allocated to this branch for pasture research. The soil on this area consists of an exceedingly poor-bodied, coarse-grained, granitic sand, carrying a very

heavy growth of timber, but very little grass, the maximum carrying capacity being estimated at one beast for 20 acres.

The whole of this area has been surveyed and cut up into 20-acre paddocks, which have been fenced. Four of the 20-acre paddocks have been left in their natural condition, and the remainder have been cleared and stumped, with the exception of sufficient trees for shade purposes.

The plan of experimental work on this station is the same in principle as at Matopos, but in addition an attempt is being made to determine the influence of stumping and clearing the land on the botanical composition and carrying capacity of the veld herbage. This station was not taken over until February, 1930, but despite the large amount of development work necessary before the proposed plan of experimental work could be put fully into operation, it is anticipated that the whole scheme will be working by the end of January, 1931.

Results of Experiments for the Season 1929-30 on the Pasture Station, Matopos.—Owing to the large amount of development work that had to be carried out at Matopos, and the fact that the station was not taken over until November, 1929, it was not possible to carry out the full plan of operations during the season 1929-30. A commencement, however, was made with the work from the chemical standpoint, and in this connection 6 soils and 82 grass samples were analysed during the year.

The results of the chemical analyses of the grasses show:—

That the feeding value of the grass is largely dependent on its stage of maturity and not solely upon the season of the year.

The grass on all the black land paddocks after the end of December showed a progressive decrease in feeding value during the growing season, and in general a marked fall in protein content between the end of January and the end of February.

A further marked fall in protein takes place between April and May, but from May onwards very little further deterioration takes place. Generally speaking, it may be said, judging by chemical analysis, that the grass growing in this area is considerably superior to grass growing on the dolerite or diorite soils in the maize belt, and is the probable reason that cattle have been noted to thrive better in certain parts of Matabeleland than on the red diorite soils in Mashonaland. Even during the dry season it is shown by chemical analyses that the dried grass (foggage) on the black land paddocks at Matopos has a protein content 50 per cent. in excess of similar foggage on the red dolerite soil at the Salisbury Experiment Station.

Monthly Cutting.—The object of the monthly cutting of the grass was to simulate rotational grazing. As one would expect from research carried out in other parts of the world, it was found that the chemical composition of the herbage, which was never allowed to grow beyond the height of 5 or 6 inches, differed widely from the grass of which the growth was unchecked. The protein content of the grass cut monthly was almost as high in April as it was at the beginning of the wet season, whereas, as previously stated, the uncut grass had fallen off considerably in feeding value.

A further point of interest was that the aftermath from the paddocks cut for hay showed a protein content approximately equivalent to the grass on the same paddocks in January, and in some cases the protein content of the aftermath was from 40 to 60 per cent. higher than the hay from the same paddock.

It has also been found that whereas the phosphorus, potash and chlorine content of grass ordinarily decreases as the growing season advances, where the grass is cut regularly the mineral content is maintained, or may in some cases be increased.

The importance of these findings to the stock breeder is obvious, and the results of the experimental work to date indicate fairly clearly that by a proper system of veld management, including rotational grazing, it should be possible, without the expenditure of a single penny on fertiliser

treatment, considerably to improve the value of the veld for grazing purposes during the latter part of the growing season. Chemical analysis also shows that the cutting of grass for hay in the Matopos district at the end of January results in a hay having anything from 25 to 50 per cent. more protein than the same grass cut for hay at the end of February. A further point of importance is that the aftermath from hay cut at this season has a greatly improved feeding value over grass that has not been cut.

The influence of fertiliser treatment will not be measurable until later on in the season, but the value of nitrogenous fertilisation in increasing the growth factor is abundantly apparent to the naked eye even at this early stage of the experimental work.

Botanical Report.—Prior to taking up her appointment on 1st November as botanist for the pasture research investigations, a visit was made by Miss Stent to the pasture research stations in March in order to make a preliminary botanical survey of the veld herbage.

Miss Stent's report is as follows:—

Matopos.—A collection of the various grasses occurring in the black land paddocks has been made by Mr. Rattray, the Government botanist, and permanent quadrats were laid down in the various paddocks during the month of February.

The actual percentage of the various grasses in the black land paddocks has not yet been worked out, but the following are the dominant grasses of the area:—

1. Perennials.—
   Digitaria milanjiana, Setaria sp.
   Ischæmum glaucostachyum.
   Dicanthium pappilosum.
2. Annuals.—
   Chloris virgata.
   Brachiaria isachne.
   Sorghum versicolor.

These are all grasses considered to be of good feeding value. The annuals are, of course, less desirable than the perennials, and of these latter the *Digitaria* and the *Ischæmum*, which do not form dense stools, but spread by underground stolons, are more desirable than the *Setarias*, which are bunch grasses.

Of the sand veld area no exact analysis has yet been made, but the grasses there are very sparse and of a poor quality, consisting mainly of:—

Andropogons sp.
Trachypogon plumosus.
Schizachyrium sp.
Pogonarthria squarrosa.
Aristida congesta.
Eragrostis spp.

Marandellas.—When this area was visited in March, stumping had just been commenced and no paddocks had then been laid out. The preliminary survey of the area showed the lower portion to consist of heavy vlei land containing an abundance of sedges, which formed a thick mat on the ground. Towards the edge of the vleis grasses became more abundant and the vegetation was not so thickly matted together. As the land sloped upwards into dry granite sand the area was fairly heavily wooded, chiefly with msasa (*Brachystegia randii*). Vegetation on this sandy, dry soil was extremely thin, but of a fairly good type, though there appeared to be rather a high percentage of grasses belonging to the *Andropogoneæ*, which do not on the whole make very good pasture. The most plentiful grasses were:—

Chloridion Cammeronii.
Craspidorhachis Rhodesiana.
Tricopteryx simplex.

Rhynchelytrum nyassanum Stapf, *Digitaria* sp. and *Panicum* sp. were also present, but were rather rare.

This area was again visited in December after the stumping had been completed and the paddocks fenced. Good rains had fallen and all over the area the grass was dense and well grown, even on the higher sandy portions where before it had been so sparse. It was difficult to recognise this as the same area previously visited, as the process of stumping had already resulted in a better type of grass becoming dominant, and it was found that *Digitarias*, *Rhynchelytrum* and *Panicum* now constituted the greater part of the herbage, except in the low lying vlei land, where sedges still held their own.

Acknowledgment.—I should like to record my appreciation of the great assistance that has been rendered by the Irrigation Engineer and his staff in the laying out and surveying of the paddocks, supervising the erection of the buildings and the installation of the water supplies in the paddocks.

The assistance rendered in these connections has not only resulted in the work being carried out efficiently and expeditiously, but has meant a considerable saving of funds and the avoidance of any unnecessary expenditure.

Staff.—*New Appointments*:—

J. F. Duguid appointed Assistant Agricultural Chemist on 25th December, 1930, *vice* Miss J. M. Anton (resigned).

B. S. Ellis appointed Assistant Agricultural Chemist, *vice* R. McChlery, seconded as Research Chemist (pasture research).

Acknowledgment is made of the loyal and efficient services rendered by all officers of the branch during the year.

A. D. HUSBAND,
Chief Chemist.

Report of the Chief Entomologist for the Year 1930.

AGRICULTURAL.

The year under review was notable for a widespread outbreak of "army worm" (*Laphygma exempta*, Wlk.), which occurred during the early part of January and covered practically the whole of the maize growing area of the Colony. Outbreaks occurred at Umtali, Inyazura, Rusape, Marandellas, Bromley, Enterprise, Salisbury, the Mazoe Valley, Banket, Ayrshire-Sipolilo, Sinoia, Norton, Gadzema, Hartley, Gatooma, Gwelo and Fort Victoria. The outbreak was first reported on the 3rd and remained severe for about two weeks. Damage was inflicted mainly on the maize crop. Supplies of poison and pumps were despatched to the infested areas by passenger train and by motor lorry.

The farming community now approach the Government immediately for assistance during an outbreak of army worm, and assistance has been rendered in all cases as promptly as possible.

Locusts.—During the first few days of December movements of swarm locusts attracted attention near the Victoria Falls, and some swarms crossed over the north-western corner of the Wankie district. The species, which was identified from specimens collected in Northern Rhodesia, proved to be the red-winged locust (*Nomadacris septemfasciata*, Serv.). The swarms apparently left the Colony immediately, and no egg laying is known to have taken place within our borders.

Maize Pests.—The maize stalk borer (*Glottula fusca*, Full.).—Investigations into the over-wintering habits of the larvæ were continued during the year. It was found that there was no definite migration of the larvæ into the roots as occurs on the high veld of the Transvaal and in other cooler climates. Approximately 85 per cent. of the larvæ were found over-wintering above the ground level in the stalks. In an infested trap crop used for experiment approximately 66 per cent. carried larvæ and pupæ into November.

Trap cropping against this pest was again practised at the Agricultural Experiment Station, Salisbury, the trap crop being infested to the extent of 97 per cent. The amount of protection given to the main crop was not as high as former trials, some 40 per cent. of the main crop being infested. This was due to the lateness of the rains, resulting in the trap crop and the main crop germinating about the same time. The application of additional fertiliser after germination forced the trap crop ahead.

Emergence of moths from the over-wintering brood covered the period from 4th to 19th December, being thus considerably earlier than last year.

Other maize pests prominent during the year have included: (1) Earworm (*Heliothis obsoleta*, F.), several reports of severe attacks in April; (2) black maize beetle (*Heteronychus foveolatus*, Jack), Lomagundi in January; (3) snout beetle (*Tanymecus destructor*, Mshll.), prevalent in Salisbury and Mazoe districts in December; (4) cutworm, damage has been reported from various parts.

Tobacco.—Root gallworm (*Heterodera radicicola*).—A series of rotation experiments was inaugurated at the Tobacco Experiment Station in 1929; this was designed to test the possibility of eradicating this pest from the soil, yet at the same time maintaining soil fertility and giving an economical return from the land over a period of years. The first year's results showed that double ploughing and thorough aeration of the soil during the winter months failed to eradicate the pest, but an excellent crop of tobacco was grown on land so treated which had failed to yield a satisfactory crop the previous year. Two crops previously considered as immune were shown to carry a very slight infestation, viz., Sunn hemp and Florida Bunch velvet beans. These experiments will not be completed until 1935.

The tobacco aphis (*Myzus persicæ*, Sulz.) caused damage to some crops of Turkish tobacco in May. The tobacco capsid (*Engytatus volucer*,

Kirk.) was also prevalent, but caused little damage. Ants were reported from several localities as carrying off germinating seedlings from tobacco seed-beds. Other tobacco pests reported have included: (1) Cutworms, severe damage in two localities; (2) stem borer (*Phthorimæa heliopa*, Lw.), a considerable acreage replanted in one area; (3) wireworm (*Trachynotus sp.*).

Citrus.—Thrip (*Scirtothrips aurantii*, Faure) was reported as prevalent on citrus during the year, particularly on Washington Navels. A severe outbreak of American bollworm (*Heliothis obsoleta*, F.) occurred in November. Control by hand picking was successful. This information has been obtained through the courtesy of the entomologists employed by the British South Africa Company.

Cotton.—Owing to the decreased area planted to cotton, very few complaints of insect pests were received. The American bollworm (*Heliothis obsoleta*, F.) caused very considerable damage to the crops on the Cotton Breeding Station, Gatooma, and elsewhere in the cotton growing areas. The control of this pest is being attempted by trap cropping, hand collecting, and by the release of an egg parasite (*Trichogramma lutia*, Gir.). This work has been undertaken by the officials of the Empire Cotton Growing Corporation.

MEDICAL AND VETERINARY.

Tsetse Fly.—The tendency of the tsetse fly (*Glossina morsitans*, Westw.) to spread towards its former limits in the Colony has shown no signs of abatement during the year under review. Whilst no areas are known to have been vacated by the pest, except where definite efforts have been made to effect its dislodgment, records of further encroachment have been secured in several localities. This year's record is merely a continuation of the record of preceding years since the great contraction of the fly areas following the year 1896. The unremitting tendency of the fly to spread in all infested districts needs to be borne in mind in connection with the reports on the operations in progress during the year. It is too early to forecast what success is likely to attend the game reduction measures mentioned in last year's report, which have been inaugurated under the direction of the Native Commissioners over various portions of the fly front. In some localities this measure is admittedly unlikely to achieve the object of checking spread of fly, owing to the nature of the country and paucity of the native population, but in others the prospect is more hopeful. In the one area where this measure has been in operation for a sufficient length of time, namely, the Sipolilo sub-district, useful results appear to have been achieved. Operations were commenced here in 1924, and have been followed by material improvement in the position. With regard to operations proceeding under the direction of the Entomological Branch, a marked effect on the fly population has been produced in the Lomagundi (Umboe) area, and appreciable retrogression of the limits of the definite fly area is apparent. It is disappointing that some further cases of trypanosomiasis in cattle have occurred on the farms during the year.

In the Gatooma sub-district, whilst all indications are in the direction of improvement rather than the reverse, it is safest not to draw any conclusions at present. It is clear that considerable further progress will need to be made before the farms in this district lie altogether outside the range of wandering flies from the definitely infested area.

It is natural that some impatience should be felt concerning the tardy appearance of fully satisfactory results from these operations, but it is to be realised that control of *Glossina morsitans* constitutes a problem which has not been satisfactorily solved in any part of Africa. I may be permitted to quote the words of Sir Guy Marshall, Director, Imperial Institute of Entomology, at the Pan-African Agricultural and Veterinary Conference at Pretoria in 1929, namely:—"There is another point which, I think, is not altogether realised by many governments, namely, that the

eradication of tsetse fly is going to be a very long, slow, and expensive business." This is in reality self-evident from the nature of the problem.

It is regrettable that to date it has not been found possible to make adequate provision for scientific research in reference to the bionomics and ecology of tsetse fly in this Colony. Efforts have been made by the branch in the direction of acquisition of knowledge concerning the life economy of this insect, but field investigations have necessarily been concerned largely with throwing light on the progress of the operations. A properly-staffed and equipped field laboratory for tsetse fly research is undoubtedly highly desirable when the finances of the Colony admit of the necessary provision.

1. Operations, Lomagundi (Umboe).—These operations were commenced in December, 1925, and were extended to a newly-fenced zone on the northern side, that is, towards the fly area, in July, 1928. In February, 1930, operations were also extended to the west of the Angwa River, where there were indications of the advancing fly outflanking the fenced zone. The maximum number of native hunters employed during the year has been forty-two, with two European rangers. The southern fenced area adjacent to the farms was never more than very lightly infested with fly, except close to what is now the middle game fence, but flies could be caught by diligent search in most parts. There were, however, at least two small apparent fly centres south of the fenced zone. The northern zone, on the other hand, was definitely infested with tsetse practically throughout, and in many parts the density was considerable previous to the extension of operations in this region. In the southern area no tsetse flies have been seen throughout the year, except in one locality. An occasional fly was taken in this locality and also south of the southernmost game fence in the same region. Direct and close inspection of the locality failed, however, to reveal any tsetse, and in view of the fact that fly was not found in this locality in previous years, it appears justifiable to deduce that their presence was due to some temporary local factor. In the northern zone the reduction in density of the fly since the commencement of hunting is marked, and may be indicated by the following figures, based on fortnightly collections in certain selected localities:—

Average male density, 1927 (Aug. to Dec.)	34.4
Average male density, 1928 (June to Dec.)	24.0
(Hunting commenced in July.)	
Average male density, 1929 (July to Dec.)	5.8
Average male density, 1930 (July to Dec.)	1.5

The figures from 1927 to 1929 refer to exactly the same localities, but the figures for 1930 include other localities, close to the northernmost fence, where the fly was known to be particularly abundant in previous years and still persists in greatly reduced numbers.

Corresponding figures for two localities each four miles beyond the northernmost fence, where the game has not been disturbed, show a much higher density than the fenced zone, both in 1929 and 1930, but there is a considerable apparent reduction in 1930. Whether this, if reliable, is a normal variation, or whether at a distance of four miles the effect of game reduction between the fences is also felt to some extent, is uncertain, but the latter might quite possibly be the explanation. Comparable figures for the two localities north of the fenced zone give an average male density of 32.4 for 1929 and 16.0 for 1930, but these only cover the period from late September to early November, and the number of collections is insufficient to give a just comparison. The average male density for the whole year 1930 in selected localities four miles north of the fenced zone, including a traverse not utilised in 1929, is 20.7.

Collections off man north of the fenced area in 1930 (game undisturbed) gave a female percentage of 16.8 per cent. (2,316 flies). Similar collections within the northern fenced area (game intensively hunted) during the year gave an average female percentage of 29.6 per cent. (442

flies). *A high female percentage caught off man is judged to indicate hunger conditions.* There is thus a marked difference between the fenced area and the undisturbed zone beyond. The female percentage in the fenced area during 1930 is not as high as might be expected. The average female percentage in this area in 1927, when it was kept practically as a game reserve, was 12.6 per cent. (705 flies). In 1928, the year hunting commenced in this section, it rose to 20.7 per cent. (1,063 flies); in 1929 the average was 40 per cent. (293 flies). The apparent fall in 1930 is presumably due to collections made close to the limiting fence, the localities utilised in previous years being now too unproductive of flies to furnish figures in this connection. With the exception of the small portion between the Tchetchenini Road and the Angwa River, where tsetse is still to be met with in very small numbers not far from the middle fence, fly in the northern zone is now more or less confined to a belt within four or five miles of the northernmost fence. The density even here is comparatively low, but increases as the limiting fence is approached. The fly position in the fenced zone is thus very much improved throughout, and it is disappointing that some of the farmers have had further cases of trypanosomiasis during the year. These cases have been confined to three farms between the Hunyani and Angwa Rivers. The total losses have been small, namely, six head on one farm, four on another, and none at all on the third, but use of the injection issued by the Director of Veterinary Research was apparently responsible for saving the lives of four animals on one farm, nine on another, and five or six on the third. It is noteworthy that on one of the formerly worst affected farms in this area two spans of oxen have worked for the past two years without a single case of the disease having occurred amongst them. The oxen were regularly injected as a prophylactic measure in 1929, but apparently not in 1930. In addition, a considerable number of European owned cattle are reported to have ranged freely as far as the southern game fence in this locality without ill-effect.

Trypanosomiasis re-appeared during the year on two farms on the east bank of the Hunyani River on which no cases had occurred during the previous three years. One farmer lost three head and the other estimates the number of cases at twenty-three. The position is particularly difficult of elucidation, because the second farm is further from the fly area than the first. No fly could be found in the vicinity and no fresh cases occurred during the latter part of the year. The more distant farm is about 15 miles in a direct line from the present limits of the definite fly area. It is such sporadic outbreaks, at what would previously have been judged a safe distance from the definite fly area, which are delaying complete success in this particular area.

It is of interest to note that, owing to reports of increase of game in the largely occupied and "open shooting" area south of the fenced zone, native hunters were sent to this area at the request of the local farmers and there destroyed a considerable quantity of game, including such large species as koodoo, sable, etc. This indicates the extent to which European settlement in this Colony may be expected automatically to protect itself against the encroachment of tsetse fly.

2. Lomagundi South-West.—Reconnaissance carried out in 1929 had demonstrated the spread of tsetse northward from the Umfuli River, particularly up the Sisuje River, in the direction of occupied farms in this locality. Early in 1930 steps to prevent the fly from spreading further in this direction were contemplated, and it was hoped to take action in time to prevent cattle on the farms becoming infected. Unfortunately before action could be taken trypanosomiasis broke out amongst the cattle on two farms, extending later to a third, and occasioned very considerable losses. A game fence about 40 miles long has been erected between the fly and the farms during the year, and operations to drive game back from the farms have been commenced under the direction of a European ranger.

3. Catooma.—Operations in this area commenced in September, 1927, although the fencing was not completed until April, 1928. The eastern

fence was extended further south to the Umsweswe River in March, 1929, and a new flanking fence to protect the northern flank was completed early in the present year (March). These extensions of the fencing were accompanied by corresponding extension of the area hunted. Fifty native hunters under the direction of three European rangers were employed during the year. Increase in the number of hunters, closer European supervision, and extension of the area to be hunted have combined to increase the number of animals destroyed during the year, demonstrating the fact that the fenced area, although from a sportsman's point of view depleted of game, still contains a considerable number of animals which the natives' knowledge of the forest enables them to secure. There are unmistakable indications of diminution of tsetse in various localities, and fly is now decidedly scarce in a zone several miles wide immediately adjacent to the eastern game fence. Conditions between the fences are, however, not as yet comparable with those in the Lomagundi (Umboe) area.

It is of interest to note that out of 2,146 tsetse flies caught off man *within* the fenced area during the year, the average female percentage was 36 per cent. Out of 1,976 tsetse flies caught off man *west* of the fenced zone, the female percentage was 26 per cent. It should be mentioned that a considerable amount of hunting has occurred in the localities west of the fenced zone where the figures were collected during this year (1930). The collections in the fenced zone included localities immediately adjacent to the western fence, where the female percentage fell as low as 29 to 33 per cent. In localities towards the middle of the fenced area the female percentage rose to from 42 to 51 per cent. The average female percentage in 1927, the year the operations commenced, was 18.4 per cent. (4,203 flies), in 1928 it was 15.4 per cent. (455 flies), and in 1929 it was 23.2 per cent. (815 flies).

Certain farms in this district which sustained losses last year have had few or no cases this year, and no new farms are known to have been involved. Whilst the position cannot be said to have improved appreciably on two outlying farms, the general position has been easier and gives reason for anticipation of further improvement if the operations are continued.

4. Umfuli River.—Owing to cases of bovine trypanosomiasis contracted on farms abutting or near to the Umfuli River above the Magondi Native Reserve, it was decided to attempt to reduce the game in the area adjacent to this reserve. A European was placed in charge of twenty native hunters and proceeded to the area on the 5th November. The number of animals inhabiting this area has been found, however, to be much smaller than anticipated and the operations will be discontinued. No tsetse flies have been seen in any part of the area.

5. Gwelo North.—The tendency of the fly to outflank the Gatooma fenced area at the southern end, namely, in the region of the Umniati and Ngondoma Rivers, led to a European with fifteen native hunters being despatched to this difficult region on 14th November. These operations were still in progress at the end of the year.

6. Wankie District.—The attempt to create a line of European settlement along the Gwaai River has been proceeded with under the direction of the Lands Department, aided by a local committee. The number of farms occupied at the end of the year is stated to be fourteen. In order to accelerate the intended effect of the settlement in holding the fly in check, native hunters under the direction of the Native Department have been stationed at intervals along the Gwaai River with the object of reducing the game. Close inspection by a special inspector has revealed the fact that tsetse fly is now established on the western side of the Gwaai River from near the Sikume junction northwards at least to the Shangani junction, and no doubt beyond. Moreover, the eastern side of the river, along the Victoria Falls road, is infested to a distance of approximately sixteen miles above the drift at the Dett-Gwaai junction. Definite infestation of the Gwaai River has thus broadened considerably, and the position at present is such as to give cause for disquietude.

7. Control of Traffic from the Fly Areas.—The number of stations for control of traffic from the fly areas amounted to four at the end of the year, namely: (1) Robb's Drift Road, Gatooma, at the eastern game fence; (2) Tchetchenini Road, Lomagundi (Umboe), near the southern game fence; (3) Mcheringe Road, Lomagundi, near the southern game fence; (4) Miami-Zambesi Road, Urungwe sub-district, Lomagundi district, near the old Native Commissioner's camp, Urungwe.

(1) *Robb's Drift Road, Gatooma.*—The guard was stationed on the road on 30th March. An analysis of the traffic was not kept in full until the beginning of June, but from that date to the end of the year 102 motor vehicles and 184 cyclists were dealt with. The total number of tsetse flies caught on the traffic was 414. It is of interest to note that the percentage of female flies caught on the traffic was actually higher than the percentage normally caught by one person off another in the fenced area. The percentage of females caught in the fenced area during the year gives an average of 36 per cent. Figures collected in reference to traffic at the gate gave a percentage of 62 per cent. females (42 males, 71 females) off motor vehicles and 45 per cent. females (64 males, 53 females) off cyclists. The particular interest lies in the fact that at one time it was not thought that the female flies of this species followed moving objects, or at least human beings, to any great extent.

(2) *Tchetchenini Road, Lomagundi (Umboe).*—Guards were stationed at the gate on 20th February, and from 1st June dealt with 108 motor vehicles and 758 cyclists. Eight tsetse flies only were caught at this gate. It should be mentioned that a very high proportion of the motor traffic originated at a point close to the guard gate near the southern game fence.

(3) *Mcheringe Road.*—Guards were stationed at the gate on 21st February, and from 1st June dealt with 27 motor vehicles and 443 cyclists. Only two tsetse flies were caught at this gate, one in May and one in August, both on vehicles from beyond the middle fence. Seeing that both the Tchetchenini Road and the Mcheringe Road, especially the former, constitute traffic routes from the undisturbed fly area beyond the fenced zone, which both traverse, the number of flies caught at these gates constitutes eloquent testimony to the present tsetse fly position between the fences.

(4) *Miami-Zambesi Road.*—The guards were stationed at the gate near the old Native Commissioner's camp at Urungwe Hill on the 24th November. The amount of traffic has been small, following the advent of rains. Eleven tsetse flies were caught off motor vehicles during December.

(5) *Sinoia-Copper Queen Road.*—In order to test the danger to the occupied farms from tsetse flies which might possibly be carried by traffic along the road leading from the abandoned Copper Queen Mine towards Sinoia, a European was stationed on the boundary of the outermost farm on 23rd July, and remained until the end of the year. He examined all traffic, including motor vehicles, cyclists and pedestrians, travelling towards Sinoia. The traffic which passed out through the gate consisted of 34 motor vehicles, 82 cyclists, and 437 pedestrians. The only tsetse fly caught was taken in a hut at the gate after a European cyclist had arrived from the Umfuli River. The rains have at least temporarily put an end to wheeled traffic along this road.

8. Reconnaissance and Inspection.—Special reconnaissance to ascertain the present approximate limits of the definite fly area has been carried out by special inspectors in the following areas:—

(1) *Lomagundi South-West.*—This has included all the country between the Tengwe and Umfuli Rivers, the limits of the definitely infested area being traced from the Mchekakasungabeta Hills north of the Umfuli River and east of the Sanyati River as far as the Tengwe River. The infested zone was found to extend only about 10 miles from the rivers mentioned, except

up the Sisuje River and its vicinity, where a salient occurs. No tsetse flies could be found on the south-east corner of the Magondi Native Reserve.

(2) *Lomagundi West.*—The approximate fly limit west of the Sanyati River has been traced from the Tengwe River northward to the escarpment.

(3) *Umfuli River* (above Magondi Reserve).—A considerable area on both sides of the river has been traversed by myself, and more intensively inspected by a special inspector. No tsetse flies have been seen in this area.

(4) *Gwelo North.*—The tsetse fly position on the Umsweswe and Ngondoma Rivers westward to the Mafungabusi Plateau has been investigated by a special inspector. Fly was found to have spread up the Umniati River above the Umsweswe junction, and between the Umniati and Ngondoma Rivers southward to about the same localities. This constitutes a definite extension of the infested area southward since the last inspection in 1928.

(5) *Wankie District.*—Special reconnaissance was responsible for the information given under section 6.

9. Technical Investigations.—These have been confined to the Gatooma fly area during the past year. An entomologist was stationed in this area from the 15th May to the 22nd December, and devoted much of his time to investigation of the breeding places of the fly, and especially to ascertaining the amount of breeding proceeding in the game depleted area between the fences. The investigation revealed a marked change in breeding sites according to the season of the year and the condition of the forest in respect to foliage. No breeding was demonstrated in the eastern half of the fenced area, and on the other hand breeding increased towards the western fence. The number of living puparia collected corresponded roughly with the density of adult flies. Observations were also made concerning natural enemies of the tsetse, including parasites and percentage of parasitisation. The percentage of parasitisation was comparatively low, but the major parasites of *Glossina,* i.e., *Mutillids* and *Bombyliids*, were represented. Notes were kept on the percentage emergence of tsetse flies from the puparia throughout the period covered. In the course of a short visit in February an entomologist demonstrated the fact that breeding was continuing during the height of the wet season, thus corroborating observations made on the Umniati River during the same month in 1923.

10. Experiments with Tsetse Fly Traps.—Reports of large captures of tsetse fly by means of a trap in Zululand and absence of any information concerning the nature of the trap led to preliminary experiments being conducted in June and July in reference to the attraction of tsetse flies into shaded enclosures. These revealed the fact that the flies were attracted even into such small enclosures as petrol boxes lying on their sides on the ground. An experimental trap was then constructed on the principle of primary attraction of the fly into shade and thence towards light and was first exposed in the fly area on the 8th August. A large number of tsetse flies were caught in this trap, which was not, however, fully satisfactory, and further modified models were accordingly constructed and tested. In the meantime particulars of the Zululand trap were obtained, and a model of this pattern was also constructed and tested, after the writer had witnessed the demonstration in Zululand on 11th and 12th November. All the traps, including the Zululand model, have caught tsetse flies (*Glossina morsitans*), but considerable further experimentation is necessary before any statement can be made concerning the prospect of any of these, or further modifications on the same principle, proving of practical value in reference to the control of *Glossina morsitans*. The heavy rains of the present season have necessitated temporary discontinuance of these experiments.

11. Visit to Zululand.—Accepting an invitation from the Provincial Administration of Natal, I proceeded to Zululand and witnessed demonstrations of Mr. R. H. Harris' tsetse fly traps in action on the 11th and 12th November. These traps function remarkably well against *Glossina pallidipes*,

the commonest tsetse fly in Zululand, and the demonstration was decidedly impressive. I desire to record my appreciation of the hospitality received and of the courtesy of Mr. Harris and his staff during the period of my visit.

Tampans in Pigsties.—An exceptionally heavy infestation of pigsties with the so-called tampan tick (*Ornithodoros moubala*, Murr.) was investigated in the Rusape district in April and May. Control was obtained by thorough burning by means of piles of brushwood of both sides of the 9 inch walls. Burning only one side of the walls and spraying with a 10 per cent. paraffin emulsion each failed to eradicate the pest.

Muscid Flies affecting Live Stock.—Many complaints have been received of the annoyance to cattle by flies of the genus *Musca*, which feed on exudations from sores, wounds, and from the bites of true blood-sucking flies such as *Stomoxys* and *Lyperosia*. The species concerned are chiefly *Musca pumila*, Macq. (*vetutissima*, Wlk.), *M. interrupta*, Wlk., *M. crassirostus*, Stein, and *M. sorbens*, Wied., which breed in fresh cow dung around cattle kraals.

Experiments with a bait of a sweetened 1 per cent. solution of sodium arsenite gave negative results. The bait, however, can be used effectively against the house flies *M. vicina*, Macq., *M. nebulo*, F., and *M. xanthomelas*, Wied., especially in the wet season. Further investigations are proceeding.

Wankie Game Reserve.—The administration of the Wankie Game Reserve was taken over by the Forest Department on the 1st of April.

Nurseries Ordinance, 1909.—During the year eighteen nurseries were registered under the Act and of these seven were inspected.

Importation of Plants Regulation Ordinance, 1904.—The following consignments have been dealt with by the Plant Inspectors at the various ports of entry:—

Salisbury	3,762
Bulawayo and Plumtree	11,263
Umtali	514
Gwelo	543
Total	16,082

One hundred and sixteen special permits for the introduction of plants, etc., into the Colony were issued during the year.

Annual permits issued to nurseries in the Union of South Africa were 73.

Regulations in other Countries affecting Export of Plants from Southern Rhodesia.—Forty-one certificates of cleanliness have been issued in respect of plants intended for export to other countries.

Lectures to Farmers.—A lecture on army worm was given to the Concession Farmers' Association in March. One lecture on entomology was given to the apprentices at the Tobacco Experiment Station in January. I attended a meeting of the Lomagundi West Farmers' Association on the 12th January with the object of discussing the tsetse fly position.

Farms Visited.—One hundred and thirty-four farms were visited during the year and advice given, particularly in regard to the control of army worm.

Third Imperial Entomological Conference.—A member of the staff attended the Third Imperial Entomological Conference held in London from the 17th to 27th June.

Agricultural Show.—The entomological exhibit was placed on the benches at the Agricultural Show at Salisbury, with an officer of the branch in attendance.

Papers Published during the Year.—

"The Bionomics of *Glossina morsitans* in the Umniati Fly Belt, Southern Rhodesia, 1922-23," by J. K. Chorley, in the *Bulletin of Entomological Research.*

"The Army Worm," by R. W. Jack, in the *Rhodesia Agricultural Journal* for October (illustrated).

"The Tobacco Capsid (*Engytatus volucer*, Kirk.)," by J. I. Roberts, in the *Bulletin of Entomological Research* (illustrated).

"Experiments on Grass Fires against *Glossina morsitans* in Southern Rhodesia," by J. K. Chorley, in the *Bulletin of Entomological Research.*

Identification of Insects.—During the year twenty-five collections comprising several hundred specimens were submitted to specialists for determination. Seventy identifications have been received from the Imperial Institute of Entomology and the British Museum (Natural History).

Fifty-seven slides of Rhodesian scale insects (*Coccidæ*), many of them co-types, have been presented to the Department by Dr. W. J. Hall.

Accommodation.—During the year the accommodation of the branch at Salisbury has been extended by the addition of two rooms fitted as laboratories. This has relieved the previous congestion considerably and admits of the entomologists pursuing their laboratory work without the interruption to which they were previously subjected.

Staff.—Mr. M. C. Mossop, M.Sc., joined the staff of the branch on the 3rd April, to take the place of Mr. J. I. Roberts, resigned.

Mrs. A. Slocock commenced duties as clerk-typist on the 12th May, to take the place of Miss W. Shepherd, transferred.

I desire to testify to the satisfactory service rendered by all members of the staff during the year. This includes not only the permanent technical and clerical officers, but the field officers engaged in supervision of operations against tsetse fly and in reconnaissance and inspection work in connection with the same pest.

RUPERT W. JACK,
Chief Entomologist.